



DR. WM. DENNY.

THE

PRINCIPLES

SURGERY.

ABRIDGED BY

J. AUGUSTINE SMITH,

OF THE ROYAL COLLEGE OF SURGEONS, LONDON,  
AND FELLOW OF THE ROYAL SOCIETY OF LONDON,  
IN THE COLLEGE OF PHYSICIANS AND  
SURGEONS IN THE UNIVERSITY  
OF THE STATE OF  
NEW-YORK.

WITH NOTES AND ADDITIONS.

NEW-YORK:


PRINTED AND SOLD BY COLLINS AND PEARSON, NO. 120  
PEARL-STREET.

1810.




*Ex libris Wm Drury*

THE  
PRINCIPLES  
OF  
SURGERY.



*By JOHN BELL, Surgeon.*



ABRIDGED BY

J. AUGUSTINE SMITH,

OF THE ROYAL COLLEGE OF SURGEONS, LONDON,  
AND PROFESSOR OF ANATOMY AND SURGERY  
IN THE COLLEGE OF PHYSICIANS AND  
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1810.

*Surgeon Genl's Office  
13018  
Washington*

ANNEX  
Surg. Clin.

*District of New-York, ss.*

**BE IT REMEMBERED** that on the thirteenth day of February, in the thirty-fourth year of the Independence of the United States of America, **COLLINS & PERKINS**, of the said District, have deposited in this office the title of a book, the right whereof they claim as proprietors, in the words following, to wit:

*"The Principles of Surgery....By John Bell, Surgeon....Abridged by J. Augustine Smith, of the Royal College of Surgeons, London, and professor of Anatomy and Surgery in the College of Physicians and Surgeons in the University of the state of New-York....With Notes and Additions."*

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**CHARLES CLINTON,**  
*Clerk of the District of New-York.*



## EDITOR'S PREFACE.

---

THE great celebrity and acknowledged merit of Mr. JOHN BELL'S PRINCIPLES OF SURGERY, render it entirely unnecessary for me to say any thing in their praise. In the Edition of them now presented to the public, care has been taken to select those parts which were deemed most useful and important. Mr. Bell's descriptions of diseases and operations, which are unrivalled by any modern surgical writer in animation and effect, are retained almost *verbatim*, and where they were thought not sufficiently full and minute, the additions which were deemed requisite will be found in a note distinguished by the letter S, at the foot of the page. Where I have differed in opinion from Mr. Bell on a point of practice, his opinion is stated in the text, and mine in a note, so that the reader can adopt that which he may think preferable.

Since the chapter on Adhesion was printed, I have read Mr. Young's animadversions upon the practice there recommended by Mr. Bell, but think no further

cautions necessary with regard to the use of sutures in promoting the re-union of divided surfaces.

Since the publication of the first volume of the Principles of Surgery, Dr. Jones has written a most valuable work on Hæmorrhage ; in the Appendix the reader will find an account of his discoveries and observations on that subject ; and in the third number of the New-York Medical and Philosophical Journal and Review, a most ingenious defence of Mr. Bell, by Dr. Davidge of Baltimore.

Since that period also, the celebrated Scarpa has written a work upon Aneurism, in which he differs from Mr. Bell, and indeed all his immediate predecessors, as to the manner in which these tumours are formed. Appendix D will enable the reader to judge of the correctness of Scarpa's doctrine.

I have deemed it unnecessary to transcribe Mr. Bell's observations intending to prove that the inosculating vessels are sufficient to support a limb when the main artery is tied, as no Surgeon is now deterred by the fear of mortification from tying any accessible artery in the human body. Three instances of this have however occurred, two are related in Wishart's appendix to Scarpa, and one in the Medical and Physical Journal for April 1809.

With regard to the best method of treating fractures of the lower extremities, I never doubted that a state of flexion and consequent relaxation of the muscles during the tendency to inflammation, was the best po-



sition in which they could be placed, until I understood that Dr. Physick entertained a different opinion and taught a contrary practice. So great is the deference which I pay to the judgment of Dr. Physick, that I am now not without my doubts on the subject; as however I have uniformly practised the plan recommended by Mr. Bell, and have never seen any ill consequences from it, I have deemed it unnecessary to state any objections to his mode of treating these accidents. But where the thigh-bone is fractured at its neck or near its trochanters, then undoubtedly the straight position is the best, and Boyer's apparatus\* I should think superior to Dessault's; either, I am afraid, would fail in a strong muscular subject, the latter certainly has.†

Mr. Bell gives the diagnostic symptoms and appearances which distinguish fractures of the neck of the thigh-bone from luxations of the hip-joint, but says nothing of the method of reduction to be employed in this latter case. In the appendix G, the reader will find directions for that purpose.

\* For a description and plate of this apparatus, the reader may consult Boyer's Lectures on the Bones, translated by Farrel, Harts-horne's edition, p. 124.

† I cannot speak of this machine from experience, not having met with a case since I procured one of them. There is a case related in the third Supplement to the Medical and Physical Journal, of complicated fracture of the trochanters, where this machine was used, in which the fractured portions were found in apposition after death. This proves nothing. There can be no difficulty in overcoming the action of the muscles, in a debilitated patient and one dying from mortification and diarrhœa, so that the fractured bones should be found in their natural position after death.

I have retained all that Mr. Bell says upon the symptoms of the stone, on which he is perhaps rather concise, but I thought there was no occasion for making any further observations upon them as the distinct perception of the stone, by the sound, can alone warrant the operation of Lithotomy. I have omitted the history of the operation and the various ways of performing it, convinced that the Gorget is the best instrument and the only one which most Surgeons will use. As to its occasionally passing through the fundus of the bladder, or between that viscus and the rectum, the former occurrence is certainly very rare, and both are to be attributed to the operator rather than to the instrument. And what mischief would not that Surgeon do who should attempt to cut for the stone with the knife alone, when he was incapable of passing the Gorget into the bladder?

It is unnecessary for me to point out all the omissions which I have made. They will be found to consist principally of histories, anecdotes, and operations, and machines now no longer in use. Some apology may be thought due to Mr. Bell for thus abridging his work, but when it is remembered that his object in writing must have been the benefit of his profession, and through it the good of mankind, he can not be offended at having his fame and usefulness thus diffused through this extensive country.

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For DISCOURSE VII. *read* DISCOURSE VI.

For DISCOURSE VIII. *read* DISCOURSE VII.

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# PRINCIPLES

OF

# S U R G E R Y.

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## DISCOURSE I.

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### SECTION I.

#### *Of Adhesion.*

THE modern doctrine and practice of procuring adhesion, for which we are more particularly indebted to Mr. Hunter and the London school, has done more for Surgery in a few years, and most especially for the Surgery of Wounds, than any other general observation, not excepting even the greatest of all discoveries, the circulation of the blood. It is now well proved, that skin will adhere to skin, flesh to flesh, bone to bone, and all these parts to each other. One part only of the human body, cartilage, will not adhere. I have seen many proofs that cartilage does not inflame, nor ulcerate, nor give out granulations, nor generate new flesh; or, at least it does so very slowly: a wound heals over a cartilage without adhering to it. We amputate a toe at the joint, and the flaps unite in two days; but still they have united with each other only, and not with the cartilage at the joint: and in a luxated limb, we find that the bone continues displaced, the cartilage never inflames, nor ever

unites with the lacerated parts, for the process of adhesion is really this: either the arteries of opposite surfaces inosculate mouth to mouth, or each cut surface throws out a mucus, into which the lesser arteries of the divided part elongate themselves; and it is thus, or perhaps by the generation of a new intermediate substance, that the continuity of the part is so quickly restored. If any one point fail to adhere, there the wound must run into suppuration, because at that point there is a separation of parts, which, being equivalent to a loss of substance, requires the generation of new flesh.

When the opposite surfaces consent and harmonize with each other in their mode and period of action, then they immediately adhere; but if one of the opposite parts enters instantly into a lively action, while that of the other is comparatively languid, such parts do not harmonize, and consequently will not unite; but they may live and thrive independently of each other; and, perhaps in this way it may happen, that opposite surfaces of skin or muscle may seem to be adhering firmly to the parts beneath them, while they adhere to each other only, and merely cover the cartilage or bone, without having any direct connexion with them. The bone, as we see in an old amputated limb, lives and thrives, is not limited in its new formation by the adhesion of surrounding parts, but grows out into a broad knob of callus or new bone. Cartilage also, as in an amputated or luxated joint, retains its pure and lubricated form.

There are, no doubt, accidents both of the constitution and of the wound which will prevent adhesion; for if the patient be of a bad habit of body, if he be lying in a foul hospital, and breathing infected air, if he be ill of a fever or a flux, or any general disease, then the powers of his system being debilitated, his wound will not adhere; or if the wound be foul, made with a poisoned weapon, or left with foreign bodies sticking in it; or if blood be poured out into the cavity of the wound, for blood in this case is but a foreign body\*, or if there be a wounded lymphatic, salivary duct, or intestine, or a bleeding artery or vein—any of these causes will prevent an immediate adhesion of the wound: or if it be a bruised or gun-shot wound, and there is a destruction of parts, the loss must be supplied, and those parts which remain must enter into a new action for that purpose, and consequently cannot adhere.

This adhesion, then, is a property of the parts of the living

\* If the extravasated blood be in reality a foreign body, how can it ever become the medium of re-union between the divided surfaces, which it certainly does in some instances? For a much more ample and satisfactory account of adhesion between divided surfaces, vide Hunter on the Blood, p. 189, and seq. S.



body, which is perfect only when their structure is entire, which operates only when the opposite surfaces touch each other by the fullest contact, and sympathize with each other in their period and degree of action. Adhesion then is interrupted if any foreign body is interposed: it is less perfect in every unhealthy condition of the system, but it is a property of which we are now so well assured, that we look for its good effects in the greatest as well as in the smallest wound, and the union of an hare-lip, after it has been cut and pinned, represents the perfection of that cure, which we attempt in every greater operation, and more confidently in every smaller wound, succeeding sometimes as perfectly after an amputation of the thigh as after the most trivial cut in the cheek.

This property of re-union between divided parts is proved by every day's experience to be so perfect, that when we do fail, which no doubt is sometimes owing to a bad habit of body, we have some reason to suspect some negligence on our own part, some extravasated blood, some open artery, some portion of detached bone left in the wound, or some awkward piece of dressing laid in betwixt its edges; we have reason, in short, to blame the want of that absolute contact which is so essential to perfect adhesion, as every part of a wound which does not touch some opposite surface, must suppurate before it can heal; and this is my chief motive for putting down carefully, in short distinct rules, the several ways in which the sides of a wound may be brought together, so as to adhere perfectly.

There is no incised wound in which we may not try, with safety, to procure this adhesion\*: nothing surely can be more kindly when applied to a wounded surface, than the opposite surface of the same wound. It has been but just separated, it may immediately adhere to it, and though it do not, no harm is done: still the wound will suppurate as kindly, as freely, as if it had been roughly dressed with dry lint, or some vulnerary balsam or acrid ointment.

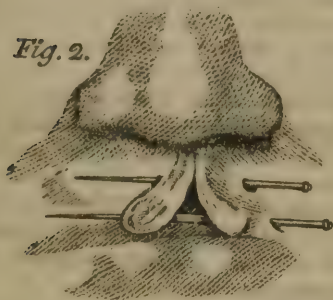
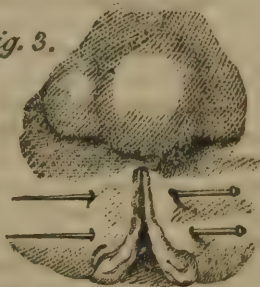
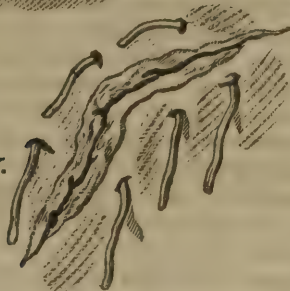
## SECTION II.

### *Of Sutures.*

For the purpose of bringing divided surfaces into contact, surgeons employ what are termed sutures: these are either dry or bloody: the former are made with sticking plaster, the lat-

\* In injuries of the head, this rule should not be too strictly observed. Read what is said upon that subject in the Chapter on *Injuries of the Head*. S.

ter with needles and thread. The dry suture is made sometimes with gum, as in our common court-plaster, which is merely gum arabic, with a little laudanum added to it, spread upon black silk. The older surgeons often used glue, sometimes whites of eggs, for we find that their agglutinative plasters took two hours in drying, which shews that they were made merely of glue. But these are dissolved by the moisture which flows from a great wound, therefore in amputation and all great wounds, we are obliged to betake ourselves to adhesive plasters, made of wax, resin, and oil\*; though straps of that kind are far from being pleasant to use, for they must be applied exceedingly warm, and the slightest degree of moisture on the adjacent skin prevents their adhering.

*Fig. 2.**Fig. 3.**Fig. 1.*

The bloody suture is of various forms, the first the interrupted suture, (Fig. 1st.) when in place of making the stitches close, and continuous, as in a seam of cloth, the surgeon just pass-

This marginal plate represents the various futures used by the modern surgeon, and as each future is described, the particular figure in this plate explaining such future will be marked.

\* By far the best adhesive plaster, for all purposes, is the Emp. Lythargyri cum resina of the Pharm. Lond. S.

ed the needle once through both lips of the wound, taking care that the needle passed as near the bottom of the incision as possible, tied the ligature and cut the ends away, and repeated the stitch from point to point, all along the wound: the several stitches are usually about an inch distant from each other, care being taken to put one at every angle of the wound. From this it was named the interrupted suture, and is almost the only one of this class now employed. Some surgeons yet retain the hare-lip suture, as it is called, from being principally used after operating for that deformity. It is made by thrusting pins or needles through both lips of a wound, and twisting a fine thread around their projecting ends; whence it is often named the TWISTED SUTURE\*.

### SECTION III.

#### *Rules for the Reunion of Wounds of the Skin.*

In all cases where the divided edges of the skin can be brought into contact, and retained so by sticking-plaster and bandage, they are to be preferred to ligatures, as the latter acting as extraneous bodies in the wound, always excite some degree of inflammation; but they answer the intention with which they are used much more certainly than the former; particularly in many parts of the face, to which bandages cannot be applied with any considerable effect, and the adhesive plasters alone are not sufficient where the parts have a strong tendency to retract. The manner of applying the plaster is to have it nicely spread upon strips of soft leather or linen, and upon this much depends after the wound has ceased to bleed, and the skin on each side is wiped dry, an assistant draws the edges into accurate contact, and the surgeon applies the plaster, previously warmed over a chafing dish of coals, first on one side, and waiting till it adheres, draws it with moderate force, and attaches it to the other. Successive strips are to be applied, until the wound is covered, so that the edges may be kept in contact throughout its whole length.

In cuts of the lips or cheeks, much neatness is required, as indeed in all sutures; but here especially, since a slight irregularity

\* I have drawn two figures, one to shew the proper manner of putting in the pins, the other to shew a very common error, which is, often as in fig. 3, the lower pin is put in a little above the red part of the lip, a considerable part of which fails to be reunited: but in fig. 2, I have shewn the lowest pin introduced as it should be, stuck through the lowest point of the lip, and introduced first so as to secure the opposition of the lowest points of the cut edges, for on that chiefly depends the deformity or neatness of the scar.

in the lip is a great deformity, and a great reproach to the surgeon. In the lip we can have no security but from the firmest kind of suture: the lip hangs loose, and is quite unsupported on its inner surface; it is very dilatable; it moves with the slightest motions of the mouth or jaws; or it is so strongly retracted in laughter and other emotions by the muscles of the cheek, that it must be particularly well secured. Though some have pretended to reunite the hare-lip by plasters, I know that even in a grown person nothing will secure it but the pin. In accidental cuts we operate exactly as after operations for hare-lip or for cancer. We take the pin, fixed in the instrument, called *porte-aiguille*, in the right hand, and holding the edges of the lip together with the fingers of the left, transfix both lips with the pin, at points exactly opposite to each other, pushing the pin with the right hand; and resisting and managing the lips with the left hand, we pass two pins\*, one exactly in the tip of the lip, through the red and fleshy part, for that secures the evenness and just form of the lip, and another through the middle of the lip, and then twist a wax thread round both pins firmly, but gently, in the form of a figure of 8†.

The pin should be drawn out the second day; they are usually left too long, and the tension of the pins occasions a suppuration, a puckering of the wound, and a visible scar. Pins are recommended in other wounds of the face, but are in no case except in the single one of a divided lip, equal to the interrupted suture. Where pins are used, I think common sewing needles, or those used by glovers, which have triangular edges, are in all cases superior to the gold pins. When you are going to use the interrupted suture, let your needles be smaller and nicer than they are usually made, less curved, and flat, with two very fine cutting edges; let your threads also be smaller than they are commonly used, and let them be a little waxed in order to flatten them and unite the two threads, but draw them afterwards through your fingers dipped in oil, in order to make them glide through the flesh. Allow the bleeding to cease entirely: if it do not stop, use an astringent, as vinegar and water; make a stitch of the needle at each angle of the wound; repeat them one for each inch in length of the wound; draw them un-

\* Three pins or stitches will be generally required: as many must be employed as will bring the parts into accurate contact. S.

† In operating for the hare-lip, it is necessary in the first instance to remove all the skin at the edge of the cleft. The piece of skin taken off resembles the letter  $\Delta$  inverted. Pins or needles are by no means necessary for this operation: the interrupted suture is I believe in more general use: it is the method I have uniformly seen employed by others, and it is the one which I have always practised with success. S.



till the edges are brought into contact; cross each intermediate space with a strap of sticking-plaster; over the whole apply a bandage, if one can be adapted to the part, so as to aid in keeping the wounded surfaces in contact.

Although the lip, nose or any other part be almost entirely cut off, if there be the smallest portion of flesh connecting it to the general system, you are not to despair of reuniting it; for this purpose you will retain the newly divided piece in its natural situation, by the means above pointed out. It is wonderful how parts will reunite after they seem to be irrecoverably separated, and deprived of any adequate supply of blood\*.

If the tongue be partly cut across, as by falling on the chin when the tongue is lolling out, or by convulsions, the tongue being caught between the teeth, the part which is divided may be joined by a stitch of the needle.

#### SECTION IV.

##### *Rules for the Reunion of deep Muscular Wounds.*

In deep muscular wounds we are obliged to rely principally upon compresses and the uniting bandage, for stitches can retain the edges only of a wound in contact; even this however is of use; they should therefore be employed, although it will be frequently necessary to cut them out, in consequence of the violent inflammation or some unfavourable symptoms which may supervene†. But you are to recollect that you do not sew such wounds with the expectation that the divided parts will adhere, but if you can keep them nearly in contact for 24 hours or a little more, they inflame, they are thickened, blood and lymph are extravasated, the cut muscles adhere to the parts underneath, and though no union takes place between themselves, they cannot retract. By this alone a great advantage is gained, for if you allow the muscles to retract while they are bleeding and moveable, and let them continue so till the wound is stiff and inflamed, they become fixed in that position, and will con-

\* Even if a part were entirely separated, if called to the case immediately, the surgeon should endeavour to reunite it. Adhesion may take place, and should it not, the attempt can be of no injury to the patient. S.

† This point is well illustrated by the case of a soldier, who being wounded at the Corps de Garde, across the shoulder through the belly of the deltoid muscle, his surgeon sewed the wound that night with many deep stitches: these Mr. Pirbrac was next morning obliged to cut on account of convulsions of the arm, which ceased the moment he had done so.

[*Memoires de L' Academie de Chirurgie.*]

sequently heal with a gap; and besides being weakened by loss of substance, their action is still more impeded by their being fixed to the skin and the parts beneath. If the wound then be broad, you must sew it with such stitches as its size and the mass of parts you have to support may require, aiding your ligatures with plaster, compresses and bandage. But if the wound be exceedingly deep, as that made by the stab of a sword, or of a pike or bayonet, you must not think of stitching it, for the mouth of such a wound bears a very small proportion to its size: you squeeze it, wash it, and trust entirely to the compresses, one of which you put upon the mouth of the wound, and should the blade have passed slanting along, you must lay a long compress wherever you think by means of it you can put the sides of the wound in contact with each other. Gentle pressure is here peculiarly useful. This is a proper case for the uniting bandage\*.

#### SECTION V.

##### *Rules for the Reunion of Complicated Wounds, where there is a Wounded Artery or Fractured Bone.*

In wounds in which large arteries are divided, the first thing to be attended to is the securing of the bleeding vessel, by means of ligatures; and after the flow of blood is entirely stopped, you close the wound, and dress it as above directed; taking care to leave the ligatures hanging out at its most depending angle. Complete adhesion cannot be here expected, as a slight suppuration will always take place around the ligatures; but if the cut be extensive, adhesion may take place to a considerable extent, which will very much expedite the cure: the ligatures may be easily taken away in a few days.

When the bone is broken or cut, still we pursue our great general intention of re-uniting the divided parts; we return the bone into its place; if it projected, stitch the skin over it, draw together all the open spaces with slips of adhesive plaster, and dress the wound with lint moistened with camphorated spirits; then apply a roller, with moderate firmness, about the part, in order to keep all firm; and finally, if it be a limb, lay it as you would do if it were fractured†. The great object to be kept

\* Vide Discourse on Bandages, fig. 11. The uniting bandage is there represented as applied to the forehead, but it is a bandage more appropriated to the limbs or body.

† This subject is treated more at large under the head of Compound Fracture.—Which see. S.

in view, is to put the divided portions into contact, and to retain them in that position. The same plan is to be pursued where a joint is laid open, even though the integuments should be greatly bruised and lacerated: try at least to save the limb; the attempt can do no harm\*.

But there is one case, and perhaps one only, where adhesion is physically impossible; and that is the case of gun-shot wounds; for the parts are not hurt and lacerated merely, but they are so bruised by the ball that they are killed, and a partial gangrene and sloughing must precede their cure. It is only after the sloughing, and during the granulation of the wound, that the parts can adhere; and the adhesion does not take place at once, but slowly and successively. But we have every motive, especially where flaps of skin or muscle are torn up by shot or splinters, to bring the parts closer and closer, as the sloughing proceeds, in order to give each point, as it resumes its healthy action, a chance of renewing its connexion with the sound adjoining parts; and thus there were certain cases, where a judicious surgeon, departing from the established rule, will venture to put a stitch in even a gun-shot wound, drawing up the points not so firmly and closely as in other cases, not with any expectation of the wound's uniting by adhesion at those points where it is sewed, but with the design of merely supporting a flap, in order to preserve it, and keep it nearly in that direction, in which he would like it should adhere; for it does adhere in the second period of that cure, where sloughing is over, and the parts begin to reunite.

Even in wounds of the belly and breast, it is adhesion of the parts inwardly wounded which saves the patient: it is quiet, perfect silence and composure, and the natural powers, that bring about this adhesion. You bring the lips of the wound gently and softly together, and retain them so: you wait patiently the event of this natural process: you can do little to assist, but you must do nothing to disturb it. Many a patient died, in consequence of the older surgeons thrusting lint into the wounds of the large cavities: and even now, we are apt to do harm, by the unmeaning and too curious probing of such wounds.

\* When the knee-joint has suffered compound luxation, it forms an exception to this rule. Under these circumstances, there is little prospect of union by the first intention. I should therefore advise the amputation of the limb, for fear the patient should die from the symptomatic fever, which would probably ensue. Amputation, indeed, would afford no great chance of recovery, as a vast majority of those, whose limbs are taken off immediately after an accident, die. For this reason, among others, I would always endeavour to save a patient who had a compound luxation of the ankle-joint. S.

## SECTION VI.

*Of cutting out the Stitches.*

Adhesive inflammation is attended with but a slight degree of fever, pain, swelling, or redness. Adhesion prevents or stops the progress of inflammation; for as it was the division of the parts which would have caused it, it will of course be prevented by their reunion\*. As every part, which is not in contact, must inflame, that inflammation may extend to the parts which do adhere; so one point left thus separate, endangers the whole, for adhesion and inflammatory action, to any considerable degree, are incompatible. The stitches, if they are drawn too tight, are too numerous, or made with too coarse a ligature, will cause inflammation: this will endanger the whole, by disposing the wound to burst open: this may sometimes be prevented by timely cutting the ligatures. The moment you observe much pain or swelling in the wound, a separation of its lips, the stitches tense, and the points where they were made particularly inflamed, undo your bandages, draw out your pins, cut your ligatures, and take away every thing like stricture upon the wound. These prudent measures may abate the rising inflammation, and prevent the total separation of the skin. But should the inflammation rise still higher, and should you perceive that a total separation and turning out of the wound is inevitable, you must throw all loose, put a large poultice around the whole, and forsake, without hesitation, all hopes of procuring adhesion. As suppuration will now come on, after it is completely established, and the inflammation has subsided, you endeavour again to bring the edges of the wound together, not by stitches, but by sticking plaster and bandage.

## SECTION VII.

*Description of those wounds where adhesion is not easily obtained, and of the accidents by which it is hindered.*

A wound will probably not adhere where its edges are not

\* Adhesion arrests the progress of inflammation in contiguous surfaces, as well as in wounds. Thus where the pleura becomes inflamed, adhesion takes place between it and the part with which it is in contact; by which means the further progress of the disease is prevented. For much important information upon the subject of Adhesive Inflammation, see Hunter on the Blood, p. 277, Burns on Inflammation, vol. 2. p. 7.



completely opposed to each other, or where they have been brought together with difficulty, and consequently the parts put upon the stretch, where there is a necessity for many and deep stitches, or a tight bandage. When a wound is deep, it does not always adhere. If there be a foreign body in it, adhesion will not often take place: an effusion of any considerable quantity of blood has likewise the same effect. A ragged and lacerated wound, one made by the crushing of great stones, of mill-wheels, or other machinery, the bite of a horse, dog, or other animal, can not easily adhere; because, from the irregular laceration, the surfaces will not correspond. The manner also of uniting a wound, may be so faulty as to prevent its adhesion; for if it is left still bleeding at the time it is stitched, if a piece of the skin be turned inwards when it is sewed, if a piece of bone, quite loose and detached be left in the wound, if the stitches be too frequent, or drawn too tight, inflammation will probably take place to so great a degree as to prevent union. If, in addition to the faults abovementioned, a roller be applied too firmly around the limb, the whole swells the first day, the stitches inflame the second, if they be not slackened or cut, they burst out on the third, and extensive suppuration ensues. But the worst case of all is, when stitches are imprudently made after a wound has already become inflamed; for then, instead of abating, they will augment the inflammation.

An unhealthy constitution is unfavourable to the healing of wounds; but under this head, I by no means comprehend a scrofulous habit of body; on the contrary we find, that in such habits a clean incision heals with peculiar ease; but if a man be scorbutic, syphilitic, or feverish, ill clothed, exposed to cold and moisture, if he be laid in a foul hospital, prison-ship or jail; if he be a prisoner when wounded, depressed in spirit, weakened in body; if he have lived long in an unhealthy camp, or in a warm climate; any wounds he may have will not quickly unite; or if they have adhered imperfectly, they inflame and burst out again the moment these circumstances affect his general health, or as soon as he is attacked with fever, dysentery, or an old intermittent. It is debility which causes this inflammation and bursting of wounds; and it is debility, either habitually or suddenly induced, which converts wounds into malignant sores.

This reminds me of telling you in the last place, how important it is to procure adhesion in the very first moment of a wound. A speedy adhesion saves pain and inflammation, prevents suppuration, wasting of flesh, a wide scar, and all the other deformities and distresses of an ulcerating wound: it prevents more serious ill consequences than pain and deformity, it

prevents that bursting of arteries so apt to happen in an ulcerating sore, or that oozing of blood which is so much more difficult to command than the most impetuous bursting of sound arteries, which is always an omen of something still worse approaching. The speedy adhesion of a wound prevents sleepless nights, diarrhœas, fever, emaciation, and the accession of the hospital fever or hospital sore. You do not know, after a battle, how soon your patient may be thrown into some foul hospital! nay, even in a stationary and well regulated hospital, your patient may be seized with hospital fever, dysentery, or some other disease. If you once get the adhesion thoroughly accomplished before any such misfortune happen, your patient is in some degree safe; if you neglect the first moment of the healing of the sore by adhesion, it may never heal; if he lie but a few days in an hospital with an open wound, the sore is followed with diarrhœa, foul tongue, nausea, and thirst; the sore degenerates, he falls into a fever and dies; his safety and his life often turn upon this single point of procuring adhesion.

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## DISCOURSE II.

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### OF ILL CONDITIONED AND COMPLICATED WOUNDS; OF ULCERS, DRESSINGS, AND BANDAGES.

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#### SECTION I.

##### *Of ill conditioned and complicated Wounds.*

THE curing of ill conditioned wounds is a wide and important department of Surgery; for under this class we must reckon almost all wounds which do not immediately adhere; all complicated wounds, in which gunshot wounds are included, and all others, in which extensive suppurations must necessarily take place, or the part mortifies. Whenever, therefore, from the nature of the accident, it is impossible to procure adhesion, your next endeavour should be to bring on suppuration; for which purpose you must have recourse to warm fomentations and

poultices frequently renewed. These must be discontinued as soon as the suppuration is established, for after that the relaxation of parts which they induce, is highly injurious. After providing free outlets for the matter, a circumstance to which very particular attention is to be paid, dress the wound for a few days with dry lint only\*, taking care to apply moderate, regular pressure, by means of a roller, from one extremity of the member to the other, if it be one of the limbs which is affected. Should the granulations appear pale and flabby; should the discharge of matter continue, some stimulant application will be necessary in order to excite the parts into a more vigorous action, for these are the effects of debility. A poultice then can be useful in the first days of a wound only, either where from the nature of the accident it is impossible to procure adhesion, or where it has been vainly attempted. Even in the case of a common abscess, though we have no application so soft and pleasant, so effectual in relaxing the skin and promoting suppuration, as a poultice, as soon as the suppuration is perfected, and the abscess is opened, the continuing the poultice (as is too often done) relaxes the part and increases the discharge. Even in this case, the fairest of all for using poultices, we employ them but for a time and for a purpose. While then an abscess is forming in a limb, which has been severely injured by some accident, you will watch it with incessant care; for an abscess which might at first be easily cured, often by being neglected goes down to the bone. At each dressing you feel carefully all parts of the limb, you allow no appearance of redness, no complaint of pain, no feeling of softness to pass unobserved. In a disease like this an abscess does not project from the surface like a boil, but works downward, among the muscles, long before the part becomes red. This is an abscess forming in the midst of a great mass of thickening and disease; the abscess is often the flattest part of the limb; and when you feel one part sinking below the level, and the integuments becoming thin; when your fingers sink into a softish hollow, which feels empty, with a hard and knotty border surrounding it, you may be assured the abscess is formed. Then you must open it, lest the matter sink deeper among the parts; you never make a large opening, nor cut up the skin, but use, in place of the broad shouldered abscess lancet, a small bleeding lancet. Strike deep;

\* Where the discharge is profuse, pressed sponge is better than lint, as it more completely absorbs the matter as fast as it is secreted. For the proper local remedies vide section on Ulcers. Attention must at the same time be paid to the general health of the patient. Bark, wine and opium, together with a nourishing diet, unless they be contra-indicated by inflammatory symptoms, must be prescribed. Without attention to the state of the system, and the exhibition of the proper general remedies, topical applications will be of little avail. S.



open the abscess thoroughly, but with an opening so small, that you need press out the matter diligently every day. You will soon discover whether your opening be central, and whether the exit be free; you introduce your probe, and feel whether there be any undermining of the neighbouring parts, any obliquity of the abscess, or whether the abscess be of such extent that a counter opening is required; you squeeze out the matter gently, but with perseverance; and having emptied the abscess, you take advantage of its sides being put together, and endeavour to reunite them; you fit your compress to the shape of the hollow, you make it of soft rolled lint, sometimes you lay on the lint in handfuls; you roll the part carefully, and with such a degree of firmness, as keeps the sides of the abscess in contact; though you may not procure adhesion at the first, you reduce the size of the cavity, lessen the quantity of matter in a remarkable degree, and in the course of time, you find the parts grow firm, and the sides of the cavity adhere.

By this prudent and careful proceeding, you gain every object; you save the skin from being further destroyed, and the parts within from being further drawn into disease: but if you neglect this opening, the muscles, or even the bones suffer; if you open the part with an incision\*, especially in an hospital, the infection comes upon the sore, and the patient dies; if you open it, and then neglect it, the openings grow fistulous, and new abscesses are formed. By opening the wrist joint, in a case of gunshot wound, with a small bleeding lancet, in three points, with these precautions, I have saved the joint; whereas the slightest incisions, in the same wards of the hospital where this man lay, burst out into frightful sores.

You must learn to vary your practice according to the nature of the case, and especially according to the parts concerned. If the suppuration be on the outside of the fascia, or strong binding membrane of the arm or thigh, then your chief business will be to observe the rapidity with which the matter will undermine the skin; for the fascia, like the membranes of a joint, excludes the inflammation, and resists it; the skin only is inflamed, its cellular substance is destroyed; the skin, by being

\* I can by no means agree to the propriety of the practice here recommended by Mr. Bell. If the opening be not sufficiently extensive and dependent to evacuate the matter, it must, by being confined, keep the sides of the abscess apart, and thereby prevent their union. In a foul hospital the practice may be proper, but certainly under no other circumstances. I do not mean that an extensive suppuration should be laid open from one end to the other, but I hold no principle in Surgery better established than that openings sufficiently extensive for the evacuation of matter should be uniformly made. Where matter has formed under the fascia of the thigh, I have seen the best effects, even in an hospital, from an incision three or four inches in length. S.



thus separated from the fascia beneath, is so far deprived of its nourishing vessels, that it is hardly alive ; it is thin, livid, ready to burst, and the least accident will make it slough, and fall off in gangrene. If the inflammation be near the haunch, the abscess undermining the skin of the thigh, bursts at the knee ; if in the leg, the matter follows the muscles to the ankle ; if in the fore-arm, it bursts out at the wrist ; and some degree of management is necessary to give a free vent for the matter, so as to preserve the skin.

In gunshot wounds, or in bruises from great splinters in battles at sea, you will most particularly observe this course of the matter from above downwards. It is from this working of the matter to distant parts, that the surgeon, after long searching, is often disappointed of finding the ball, and feels for it at the point most distant from its real place. If, for example, a man is shot with a musket ball in the haunch, the whole thigh will swell, the integuments will be separated from the thigh, the muscles too (especially if the wound be deep), will be, as it were, dissected by the matter ; the chief abscesses will burst near the knee, the surgeon will search there in vain for the foreign body ; the patient will be exhausted by pain and hectic fever, and when he dies the ball will be found lying flattened against the haunch bone, or sticking about the trochanters of the thigh bone : or a ball passing clean through the fore-arm, the abscesses, which begin to form about the elbow, will extend down to the wrist ; or the elbow being only bruised and slightly wounded with a splinter, the abscess which forms will cover the whole of the bellies of the extensor muscles, and burst at last near the hand\*.

Here, then, you may easily perceive, that it is not the foreign body lodged in the wound, nor the bruising of the parts, but the matter itself following the tract of the muscles that causes this extensive disease : to prevent which, you must attend chiefly to these things ; first, To open the abscess early, knowing what destruction the confined matter will make, if left soaking its way downwards through the cellular substance of the skin : Secondly, If you find that it has already made great progress, and that the abscess points below, you must introduce your long probe, pass it down to the very lowest point, and cut it out, so as to make a counter opening, by which the abscess will have from all parts a free discharge : Thirdly, The skin being thus weakened, being already highly inflamed, unsupported by vessels on its lower surface, its cellular substance being entirely destroyed by the suppuration, there is great danger lest it slough,

\* But this takes place only where the abscess forms under the fascia with which the limbs are invested. S.

with a total loss and destruction of the integuments of the forearm, for example: injections, even of the most simple kind, are in these circumstances so dangerous, that if unfortunately a stimulant injection be thrown in under such an extensive surface of diseased skin, it will gangrene and slough; or if, under pretence of evacuating the matter freely, this inflamed skin be imprudently cut up with a bistoury, the skin must inflame to the very highest point, beyond what it can bear; and being unsupported by its natural vessels, it will die and slough off. For these reasons, then, you never are to use the knife; you are only to make fair counter openings; when you push through your probe, you may draw after it a small and fine seton\*; but even a small seton is too irritating, and you are to continue it only a few days till the opening be thoroughly established; whenever you are sensible that the course of the matter is free, you must try to lessen the cavity, and to keep this great surface of the skin in contact with the parts below by a gentle roller; but the bandage must be rolled very gently and very equally, and your compression must be made, not so much with firm bolsters, as with a handful of plucked lint laid over the whole; you thus press down the skin that is already injured, so as to make it reunite, and you oppose a barrier to the further progress of the suppuration.

If the inflammation, in place of merely undermining the skin, go deep among the muscles, then the matter finds new cavities and hollows to lodge in, makes new and crooked passages for itself from point to point; one abscess forms after another, the suppurations become very irregular and extensive, and this is what surgeons incorrectly call a fistulous sore. It is not so! for while the parts continue inflamed, and the suppuration good, the disease, however extensive, is merely an irregular abscess; and what is chiefly required is some means of diminishing the number of irregular suppurations, and as it were concentrating the disease; for the surgeon seeing matter confined, the openings narrow and irregular, and new abscesses forming from day to day, is uncertain which way the matter tends. He knows that it is destroying the muscles, and fears that it may be spoiling the bones; therefore he chooses from among the number of openings those two which seem most convenient for his purpose, and introduces a seton from the one to the other; or from one opening he pushes down his long steel probe to the bottom of some recent suppuration, cuts out the probe, and so

\* From Mr. Bell's own reasoning we apprehend the seton would be altogether improper: a piece of lint, introduced between the lips of the wound, would produce all the good effects he seems to expect from a seton, without materially increasing the inflammation, already too great. S.

draws a seton through the most central part of the suppurations. This seton is not to be removed when the new opening is established ; it is to serve a more important purpose, it is to lead the pus to those particular openings which the surgeon has chosen, it is to prevent the matter working deep among the muscles, and draw into this single channel the matter of all the collateral abscesses. The seton concentrates, as I may express it, the inflammation and suppuration, and brings the disease into one direct line, so that we know where to apply our compress and roller ; we so narrow the passages, and lessen the quantity of matter, and empty the collateral abscesses, by the operation of this seton, compression, &c. that in the end the seton may be withdrawn ; but more commonly a fistula proceeds from some foreign body lodged deep, a ball, a piece of iron, a rag of cloth, or a spoiled bone, which prevents the healing of the wound : and the circumstances and peculiarities of a fistula are very easily and naturally deduced from this cause ! for where foreign bodies are lodged in the part, and of course foul matter is allowed to stagnate, the part cannot easily heal ; but the passages where this foreign body is not immediately lodged, recover almost their natural condition, and the only inflammation is at the bottom of the wound, where the foreign body lies irritating and supporting the flux of matter, which must find its way out.

Here our business is rather to excite inflammation, and provoke the sensibility of the parts\*. We use setons and injections in this case, with a very different, and much bolder design. Setons are used rough and large, that they may irritate ; they are used, as bougies are (in cases of stricture), to force the parts into a state of suppuration, and to destroy the callosity. They

\* It will be in vain to attempt the cure of these fistulas until the foreign bodies are removed in a great majority of instances. In some rare cases foreign bodies become enveloped in a sac, which prevents their irritating the parts in which they are lodged ; but this is so unusual that it ought never to be calculated upon, and never takes place I believe where a piece of dead bone or cloth is the irritating substance. These sacs most frequently form around leaden bullets. After the foreign substance is extracted, should the fistula not heal, then the plan of treatment recommended by Mr. Bell may be adopted. Where these extraneous bodies cannot be removed, all that the surgeon can do is to support the strength of the patient, prevent the formation of new abscesses as far as is in his power, provide dependent openings so that the matter may not lodge, and bandage the part so that it cannot burrow, and lastly, examine from time to time so as to extract these substances as soon as possible. The openings may be prevented from closing by introducing pressed sponge. When a bone is shattered by an accident, the surgeon should carefully remove all the splinters which are so nearly detached that they cannot live, and all other foreign substances which he can discover without too much probing and examining of the wound. It is true these things may be discharged in the suppuration which must ensue, but it is likewise true that their early removal will tend very materially to diminish that suppuration. S.



are, like bougies, often loaded with irritating medicines, as red precipitate mixed with basilicon, and the cords are drawn through every day. We also inject a fistula sometimes with barley water, merely to cleanse it; but oftener with tincture of myrrh, along with bark decoctions, to correct a putrid ichor, especially when there are corrupted bones in the fistula, or where blood has been extravasated through the cellular substance, which produces always very foul and fœtid suppuration. Sometimes we are really under the necessity of using escharotics, as injections of ærugo with oil, or strong stimulants, as turpentine diluted into the form of a balsam, with oil, basilicon ointment, or balsamum arcæi, which balsams we pour into the fistulous holes hot, but not too strong; yet for a slightly stimulant and cleaning injection, perhaps there is not a better than rough red wine.

Even small incisions are allowed here. We lay open any smaller fistula in order to get a more direct passage for our seton or injection into the greater fistula, or to enable us to cure and heal up some collateral fistula. We also use sometimes a sponge tent, or piece of gentian, to dilate some particular opening, or to make way for confined matter; and when, by care, and various inventions and practices, we have obliterated the collateral fistulas, made good counter openings, procured a free vent for the matter, and brought the whole disease into one direct line; when, lastly, we have brought the tube or inward surface of the great fistula into the state of an inflamed, active, and granulated sore, and have converted the thin ichor, into a well conditioned pus, we endeavour, with our rollers and compresses, to reunite the parts, forming, by the manner of rolling, what the old surgeons called their Uniting and Expulsive Bandage.

Wounds with collections of matter round a joint, are the most afflicting of any; the matter is resisted by the capsule, and makes its way round the joint, among the loose cellular substance; it finds out the weak parts, as the axilla or ham, and works towards them, and often it draws the acromion process of the scapula, or the olecranon of the ulna, or any other projecting bone, into disease. The joint then becomes stiffened and deformed, the integuments swell round it; in some parts abscess forms, in others the skin is wonderfully thickened; there is all the appearance of white swelling, but the cavity of the joint itself is not affected, though at last, if neglected, the disease penetrates into the cavity, and the true white swelling, or disease of the joint, is produced. When the shoulder or knee is thus massed by inflammation, hardened, as it were, into a cartilaginous knot, and perforated at all points with fistulous



sores, the ligaments of the joint are thickened, its motions are lost, and even the partial cure by a stiff joint, or Anchylosis, is hardly to be obtained. The agonizing pain and want of rest, the diarrhœa, and hectic fever, which are inseparable from this degree of irritation, often destroy the patient, or hurry us on to amputation. But while the diarrhœa and pain can be moderated, while the strength lasts, you should try to cure the disease by varying those practices which I have just mentioned. You should be careful not to relax the parts, nor hurt the little vigour that is left in them, by the application of poultices; you should remember, that the skin covering such a joint is much insulated, and tends greatly to inflame, and therefore you should be cautious in using injections! you should be well assured that the parts are really fistulous before you inject, and you should be the more anxious and prudent, because the joint itself may be affected, and you may be driving a very irritating injection into the cavity of a diseased joint; nevertheless, cleansing, or even stimulant injections, barley water, diluted tinctures, or wine, I do not condemn. You should be careful to watch abscesses, and prevent their extension, by small and frequent openings with the lancet; perhaps it may be right to use a seton, in order to procure a free drain of matter. You may occasionally enlarge one fistulous hole, in order to heal up two or three collateral holes depending on it. You should use a poultice only after an incision, when the parts are irritated, and must be appeased; a fomentation you will use often, but you should make it hot and stimulant, and continue it but for a short while; you should support the joint with compresses, or rather puffy cushions of lint, and a gentle roller; but be fearful of tents, which both irritate the parts and confine the matter, rather enlarge the fistulas with the knife. If by a shot, or other wound, the bone be crushed, you easily discover it at first, but not perhaps the whole extent of the injury. If in a scrophulous boy, the acromion, or the sternum, or any other bone, be spoiled by suppuration, you know it by the black and peculiarly fœtid discharge; you feel it with the probe through the many fistulous openings which run along the ridge of the bone; a man of experience learns even to know by the eye this state of the sore; and, if there be such a diseased bone, added to the other disorders, and if the bone be projecting at one end, you shake it from day to day till you get it out. Or if diseased integuments cover the carious bone, having fistulous holes from point to point, you take your round edged scalpel and lay the openings all into one, and take away the diseased bone. Far from sparing the integuments, you should open them freely; you will find them almost insensible, cartilaginous like the tube of a fistula, not bleeding when cut, but

rather needing an incision to excite them, and especially needing to be delivered of the diseased bone, before they can enter again into a healthy action, and granulate or unite.

## SECTION II.

*Of Ulcers.*

When in place of a deep and bruised wound, you have a flat and superficial wound, it often degenerates into a sore; and the methods by which the cure of such sore or ulcer is attempted are very generally known. Occasionally, a sore may be wrapped up in a poultice, or soaked in a stimulant fomentation to cleanse the ulcer, or to abate any pain or inflammation which our medicines may have raised; but a continued use of common poultice, of carrot poultice, of stale beer poultice, or any other, serves rather to relax and hurt the part. I believe, that very generally the cure depends on the prudent use of astringents, escharotics, and caustics, which must be changed according to the condition of the parts, and most especially it depends on perfect cleanliness and a firm bandage. If the sore be going slowly but regularly on, it requires only such slightly stimulant ointments as Turner's cerate, or unguentum tutiæ, or some other ointment made with zinc. If it be red and fresh granulating, let it be dressed with dry lint in the basin of the ulcer, and straps of ointment round the edge. If the action of the parts flags at times, and the sore looks gleety and pale, sharpen the ointment by adding a little red precipitate to it, or ærugo, or a little dried alum. If the edges are quite callous, they must either be touched with caustic daily, or pared with the knife; for if this be not done, the edge of the skin being by this callosity disengaged from the soft parts, shrinks and wastes. If the sore be flabby, with a profuse discharge, sharpen your ointment by adding to it some spirits of turpentine; the sore will often be so insensible as to require to be fairly powdered with pure precipitate. If at any time these processes for stimulating a sore have been too suddenly entered upon, or too harshly followed up, so as to excite inflammation, you must apply a poultice, or rather a warm fomentation of camomile flowers, with crude sal-ammoniac, till you restore the ulcer to a quiet and easy condition.

The most tedious and persevering ulcers are those which arise from habitual debility! such are scrophulous and constitutional sores. The most destructive and horrible ulcers are those which arise from some poison infused into the system, destroying the temperament and living powers in the parts! such

as the cancerous or venereal poisons\*. The ulcers which are the most in danger of becoming gangrenous, are those where the vis vitæ of the whole constitution, or of the particular part, is destroyed; as in dropsy.

Of the ulcers produced by local debility, there are chiefly two kinds, first, That which may happen to any part of the body where, in consequence of a wound, violent inflammation has ensued, carrying the excitement to that height, which the debilitated constitution of the part is unable to bear. Then the parts become flaccid, and run into ulcer, which is to be cured by exciting them, chiefly by those topical applications which I have just mentioned: or, secondly, A local ulcer may arise from that peculiar weakness of the lower extremities, of which we have so many proofs; for it is there that leucophlegmatic swellings, varices, ulcers, and all the earliest marks of constitutional debility first appear.

Of these ulcers, that which is in a manner peculiar to the lower extremities, is by far the most frequent. The cause of this weakness in the lower extremities, is their dependent posture; and therefore these ulcers are to be cured by keeping the limb in a horizontal position, on a level with the body. Uniform pressure, by means of straps of sticking-plaster, and bandage†, must at the same time be applied. For this purpose it is necessary, after the straps are drawn tightly around the limb, it must be firmly rolled from the toes upwards. In warm weather cold water pumped upon the limb, will be of great advantage in expediting the cure‡.

You will commonly find the general fascia or tendinous sheath which covers the muscles much concerned in ulcer; and I am persuaded that the unyielding nature of this part, more frequently than any other cause, protracts the cure. An ulcer seldom penetrates deeper than the skin, it is seldom able entirely to perforate the fascia; it is the ill condition of this insensible part that makes a sore continue throwing off sloughs for

\* When ulcers are caused by constitutional diseases, it is evidently vain to attempt their cure until the general disorder is removed. After this has been effected they are to be treated as above directed. S.

† Vide Discourse on Bandages.

‡ Ulcers of the lower extremities are sometimes caused by varicose veins, and cannot be cured until the cause is removed. The operation is very simple, dissect down and tie the vein with two ligatures, and divide it between them, as you would do an artery when performing the operation for Aneurism. Trifling as this operation is in appearance, death has been caused by it in three instances, one of which, a patient of Mr. A. Cooper, of London, I examined. The internal surface of the vein appeared inflamed, as well as I recollect. I have frequently seen ulcers improved by powdering them with prepared chalk, powdered rhubarb, &c. and then applying the sticking plaster and bandage, as recommended by Mr. Home. The best adhesive plaster is that recommended in the note \* page 4. S.



## *Of Ulcers.*

months, and spreading continually; for this tendinous sheath which lies under the skin being dead, deprives the skin of nourishment, by destroying the intermediate vessels; the skin cannot close over a part which is dead, any more than flesh can close over a carious bone; nor can it continue sound at its edges, since its edges lie over the dead fascia, unconnected with it, and no longer nourished by vessels: the skin thus shrinks from a part with which it can hold no connection, and the inflammation and the matter working backwards in every direction, destroy more and more the cellular substance which lies betwixt the fascia and the skin. This I know is the condition of most of those sailors ulcers and hospital sores which I have seen. What can a sprinkling of precipitate, or of some drug still more insignificant, do in such a disease? The fascia when once brought into this condition, is like a diseased bone, its connections are strong, it does not slough off soon, but keeps its place; the filthy, yellow, thick, and mucous-like matter of such an extensive ulcer, is produced by the gradual melting down of this fascia. Upon removing this cream-like stuff from the surface of a deep ulcer, we see the fascia covering the bottom like a sheet of soaked shamoy leather; with such a bottom as this the ulcer can never heal, the fascia itself is dead, and will never recover; it sloughs off more slowly than even a diseased cartilage or bone. Now I know that this is often the impediment to the healing of great ulcers; that the ulcer is perpetuated only from this diseased and yet unyielding state of the fascia, and this has been the occasion of many losing their legs. The habit which first produces such an ulcer is very bad; the ulcer itself, which extends so as to uncover the fascia in this manner, cannot be easily cured, although the fascia were cut away; but while it is left the ulcer cannot heal; you must therefore learn to pare and clip the fascia; and it will be some encouragement to you to know that I have often cut it up with the knife, then pared the flaps with scissors, cleared the leg of it in a few days, and brought the ulcer very suddenly into a healthy and granulating state.

When ulcers are long neglected, the worms which breed in them give a dreadful appearance to the disease. These worms may be killed by washing the sore with the juice of the leaves of green elder (*Sambucus Nigra* Linn.) These vermine are not the only ill consequences of uncleanness, for without any other cause that we can perceive, they produce the most extraordinary ulcers. I subjoin M'Gillivray's case as an example the best calculated to explain this position; for his wound was extremely small, the ulcer which followed was very singular, both in extent and appearance, and was finally cured, rather by



care and cleanliness than by surgery! Yet what is surgery in this case but cleanliness and care?

This man had been wounded on the Continent, by a ball which had entered under the clavicle and passed out behind. The great blood vessels had escaped, but he lost a considerable quantity of blood from the small arteries, which were divided by the ball. After this he was thrown into a French prison, where he endured every sort of misery for two years and eight months, by which the wounded part was brought into the wretched condition in which it was when I saw it. In winter he suffered extreme cold; he lived on bread and water only; and of the black bread which he got, his allowance was but one pound a-day; no surgery, no opportunity of cleanliness, no care. After his health had been injured by cold and hunger, the heat of summer, in a close wooded country, corrupted the skin, and covered his shoulder with this terrible ulcer; half a year had elapsed from the time of his being wounded before the surrounding parts began to degenerate into this very singular sore.

The sore never appeared to heal during the heat of summer. The skin all around both wounds (and to great extent), grew livid and very dark coloured, then broke out into white pimples; the pimples afterwards burst, and discharged imperfectly a white viscid matter; two or three pimples ran together into one, and formed a sore; then a scab covered that sore, confined the matter, made the inflammation spread, and comprehended other pustules; these, again, were in their turn closed up, the skin was undermined by successive pustules uniting; from pustules they became abscesses, and from trivial abscesses, deep inflamed sores. During the progress of this ulcer, the fœtor of the matter was such, that the whole prison was infected with it. The poor man could indeed get his sore washed with water, but no diligence could mend his condition; the fœtor was quite sickening and oppressive to himself; the ulcer spread first round the wound in the breast, then round the back over the whole skin, which covers the shoulder joint, then over the scapula, then up the neck, and down the whole side; the skin became remarkably livid, every where greatly thickened: in one place, hard and callous, in another, soft and boggy, as if there were matter under it, although there was none; in one place an abscess was forming, near that was another abscess entirely ripe, and close to that another burst, and discharging yellow, very viscid, and mucous-like pus, which undermined and destroyed the skin. These various abscesses, in all stages of progress (like ripe and unripe fruit on one branch), worked, not superficially, but deeply among the cellular substances, and the whole

skin was puffed up; you might have felt the matter in these abscesses fully a month before they burst; and while they were working under the skin, the veins were eroded, and the blood burst out, sometimes so freely as to bleed like the vein of the arm. He frequently bled to the amount of two pounds at once, and much of the blood was, at the same time, driven under the skin, by which there was mixed with the dark red of this chronic inflammation the blackness of echymosis; and along with the hardness and callosity of inflamed skin, there was from point to point a pulpy feeling, as if of anasarca, echymosis, and abscess, united. There were besides two or three flat, thrombus-like tumours, fully three inches in diameter, which when pricked with the lancet emitted only blood.

This disease being merely a corruption of the skin, arising at first from his dirty and miserable situation, and perpetuated by one little abscess after another undermining and destroying the skin; the plan which I laid down for curing him was this: I ordered him the warm bath, gave him a purge, and put him on good diet, with a little wine; I directed the warm bath to be repeated three times a week, to support a soft and pleasant state of the skin; and a fomentation of camomile decoction, crude sal-ammoniac, and a little spirits to animate the skin, was applied to the shoulder for one hour every morning and evening. The chief point was to manage the little abscesses and thrombuses so as to prevent their undermining the skin. I opened two or three with the knife; and taught his dresser how to cut each irregular abscess as it formed, down to the bottom, with a direct incision, till he reached the sound flesh. Each abscess was accordingly cut before it was fully formed, with the knife, if large, (as some of them were three inches long), and with the lancet, if small. The incisions were not made in what may properly be called an abscess, but through a piece of diseased, spongy, and suppurating skin. The matter and blood were thus prevented from undermining the skin; the inflammation was drawn away from the swelled parts towards those occasional incisions, which became then, as it were, the centres to their own proportion of the disease, and each scarification was filled with a strong mercurial ointment, rubbed in very thoroughly with a hair pencil. The consequence was, that each incision being stimulated into a right and healthy suppuration, was made to relieve the adjoining skin before it was permitted to heal. By these practices, varied according to the circumstances, this strange disease was entirely cured; it had continued two years and nine months; but by persevering in this plan, especially in respect of the scarification, (which was indeed a daily and se-





*J. Bell del.*

*E. Kearny, Sc.*

JOINER

*A BOY of the TRIUMPH.*



vere operation) he recovered perfectly in six weeks. Even the dark colour of the skin almost disappeared, and it became soft, pliable and clean.

## SECTION III.

*Of Hospital Sore or Gangrene.*

I do not regard hospital sore as a mere ulcer, to be treated like other common ulcers, but as a general affection of the system, a mortal disease; for when it rages in a great hospital it is like a plague; few who are seized with it can escape.

There is no hospital, however small, airy, or well regulated, where this epidemic ulcer is not to be found at times; and then no operation dare be performed! every cure stands still! every wound becomes a sore, and every sore is apt to run into gangrene: but in great hospitals especially, it prevails and is a real gangrene: in the Hospital Dieu of Paris its ravages continued for two hundred years, until that hospital was reformed by the present government of France\*.

Nothing, perhaps, will contribute so much to your understanding this disease, as a plain description of it in an individual case.

A boy, by the name of Joiner, belonging to the Triumph, whose ulcer I have drawn, received but a very slight and superficial wound, and for some time after the battle he continued in health, and the wound healed rapidly. But while it was to all appearance florid and healthy, with no threatening of ulceration, the boy in full spirits and strength, walking about on crutches, guilty of no irregularity, it began to look ill; a sure presage of some change of health.

There came on a cough, with symptoms of a common cold, which he imputed to his bed being placed near a door, lately open and now shut, but not walled up; then his health failed, his spirits became quite oppressed; he had occasional attacks of fever, frequent vomiting, and a continual loathing of food. With these slight and seemingly unimportant symptoms (but the tendency of such symptoms when they appear in a foul hospital is easily understood), his sore, which was no bigger than the palm of the hand, became in two days as big as the crown of a hat. The whole skin of the thigh was destroyed, the muscles were stripped of skin and fascia from the hip to the knee,

\* When I was in Paris I was agreeably surpris'd by the cleanliness and regularity of this Hospital, after having heard so much of its filthy and crowded wards.  
S.

the trochanter was almost laid bare, the hamstring muscles exposed to a considerable extent, and all the muscles of the thigh dissected in a manner which no drawing can express.

While these ulcers made their dreadful progress in any of the wounded, I could observe them pass through the several stages, first of inflammation, then of insensibility and gangrene, and then of renewed pain and sensibility. First, when the health is affected, the patient languishes for a few days, and the sore inflames; then come vomitings, diarrhœa, and a distinct fever, and the disease seizes plainly upon the wounded part. In its first stage the wound swells, the skin retracts, wastes, has a dark erysipelatous redness verging to black, the cellular membrane is melted down into a fœtid mucus, and the fascia is exposed. But in the second stage, the fascia and skin unable to bear their inflammation, and deprived of mutual support, become black, fœtid, soft, and fall into perfect gangrene; yet there are no vesicles, and the mortification is confined within the cavity of the sore. This is the stage of insensibility; the parts within are covered and defended with a perfect slough, which no medicine can penetrate, on which no applications can make any impression; and stimulants are used, without pain, of such a hot and fiery nature, as none but dead parts could resist: but when these sloughs open in the natural course of the disease, and the living parts are exposed, and the medicines begin to make an impression, it is imagined that these applications are restoring life and energy to parts which, before they were applied, seemed entirely dead! It is under this impression, that stimulants are continued of a strength which parts thus inflamed cannot bear; the disease is aggravated by them, and the cries from all sides are such as would melt the most rugged nature.

In the third stage, this gangrene ceases, the sloughs fall off, the muscles become exposed, the part assumes once more the appearance of a common sore, but fearfully enlarged; a high and glossy red, and a smooth, shining, uninterrupted surface, mark the continuance of the inflammation and disease; but if the sores are to do well, it is known by a rough, granulating, surface, somewhat dry, and of a paler colour.

If the patient is to die, the gangrene or wasting of the cellular sheaths proceeds; the skin first sloughs off; then the fascia is destroyed; those divisions and lamellæ of the fascia, which dive betwixt the muscles to enclose, protect, and nourish them, are next affected; the matter continues slimy and thick, and in prodigious quantities; the muscles are divided from each other more and more. In many who suffered under the disease at the same time with Joiner (the boy above mentioned), you could have laid your hand edgeways betwixt the several mus-

cles of the thigh. Then the vomiting, diarrhœa, and nervous symptoms increase, the pain is dreadful; the cries of the sufferers are the same in the night as in the day-time; they are exhausted in the course of a week, and die: or if they survive, and the ulcers continue to eat down and disjoin the muscles, the great vessels are at last exposed and eroded, and they bleed to death\*.

These are the forms which this disease assumes when it attacks an amputated stump, a broad and open wound, a laceration of the skin, or any surface which is apt to become a flat sore. But when it attacks a narrow wound, as a bullet wound, a wound with any pointed instrument, even the prick of a nail in the finger, it assumes at once the form of an Erysipelatous Gangrene (*Erysipelas Gangrenosa*); and when this disease prevails in the hospital, you may see even a NURSE, from some slight hurt in the hand, which at another time could have done no harm, have one day a swelling of the wound, on the next an erysipelas of the arm, with dreadful pain and low fever; on the third day the arm will become livid, and covered with vesicles, and in two days more fall into gangrene; the woman oppressed in the mean while with hiccup, low delirium, and other symptoms of approaching death.

A stump which has not adhered is a flat wound peculiarly apt to be seized with this dreadful disorder; and in wards where the disease prevails, amputation should not be performed. It is almost impossible to heal the stump; it sloughs, ulcerates, shrinks, becomes pyramidal; and to the very last moment of its healing, and even when the scar seems formed, or is about to be formed, the patient is liable to rigors, slight vomiting, a quick and irritable pulse; and then, in the course of a few days, the stump is burst open by inflammation, and spreads itself into a broader surface than even when the limb was cut off. The danger of this inflammation and ulcer of the stump is extreme; the least evil that can ensue from it, is a great wasting of substance, an exfoliation of the bone, and a conical stump: but we are often disappointed even of this imperfect cure, viz. in the form of a conical stump; for it happens in an ulcerating stump, as in other sores, that the greater arteries are eroded, and then the patient almost inevitably dies. In one day I saw three stumps burst open in this manner, each of which was so nearly

\* The author has described this disease as it appeared among the English sailors wounded on the 11th October, 1798, in an engagement with the Dutch, and afterwards put into an hospital at Yarmouth. There were three hundred wounded Dutch sailors in the same hospital, separated by a wall, among whom there was no appearance of the disease. S.

cicatrized, that you could have covered the small spot that was left unhealed with the tip of the little finger.

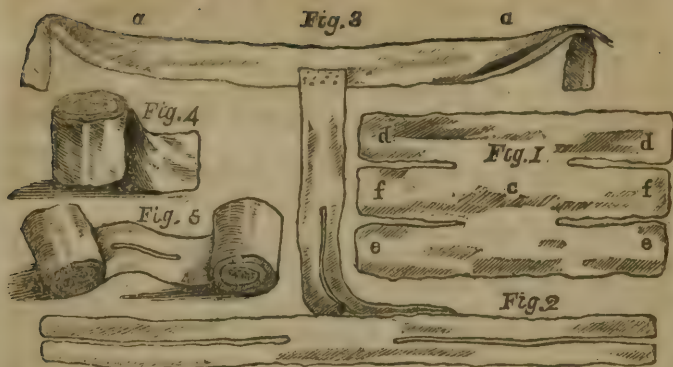
This ulcer and gangrene is in an hospital, what puerperal fever is in a lying-in ward; it is an infection to which all are equally exposed; but it is resisted by health and strength, and favoured by weakness or disease. Excesses, drunkennesses, cold, and every cause of weakness, expose the constitution to its attack. If diarrhœa, fever, dysentery, or an old intermittent, or even a common cold, attack a wounded man who lies in an unhealthy hospital, the first febrile symptoms are immediately followed by this terrible disease. The moment that a man is struck with it, you may observe him become pale, sallow, languid, low-spirited, with a heavy eye, a confused head, a loathing of food, a fretful pulse, and in short, a universal disorder, which he can neither account for nor describe; and whether this disease appear first in the system, or in the part wounded, its progress is the same. When I have observed in any case the sore to be first affected, I have noted it as a sure symptom of the approaching disorder of the whole system; or when the system was first affected, I have marked that as a sure presage of the sad change that was soon to appear in the sore. What, then, is the surgeon to do? Is he to try experiments with ointments and plasters, while men are dying around him? Is he to seek for washes or dressings to cure such a disease as this? Is he to expend butts of wine, contending, as it were, against the elements? No! Let him bear this always in mind, that no dressings have ever been found to stop this ulcer; that no quantities of wine or bark which a man can bear, have ever retarded this gangrene; let him bear in mind, that this is a hospital disease; that without the circle of the infected walls the men are safe; let him, therefore, hurry them out of this house of death; let him change the wards, let him take possession of some empty house, and so carry his patients into good air; let him lay them in a school-room, a church, on a dunghill, or in a stable.

Till some change of situation be accomplished, little can be done for men labouring under this plague; but when the disease first breaks out and rages, and while you are meditating some change, or concerting plans for suppressing the disease, you will find opium of infinite service in checking the diarrhœa and fever, for these are greatly aggravated by the irritation and pain; you must try to support the strength of your people by wine and cordials, and generous food, administered sparingly; and be careful not to overload their stomachs with bark, at a time when they are little able to bear any thing but a decoction, or a small dose of the powder. As for external applications,



tinctures of myrrh, aloes, and other drugs, still more stimulant, are improperly used in this case, as they have no effect while the slough remains, and when it gives way, produce unspeakable torture. Of these I cannot approve; keep your tinctures and balsams for fistulas, and your torturing stimulants for those local diseases which may be cured by them; but this not being a local disease cannot be cured by local applications, and therefore the mildest are the best; as, for instance, a solution of sal-saturni, which is a gentle astringent.

I think that in this hospital ulcer I have seen gentle evacuants useful; but I am so undecided with regard to the true practice in this disease, that I speak with diffidence, and would have you, if you do venture into this difficult path, proceed with so much caution, that you may, as it were, feel your own way; if you use evacuations, or a strict diet, it is but for a time, and in the expectation of renewing your stimuli gradually, and giving them a greater power over the system.



### DISCOURSE III.

#### ON BANDAGES.

##### SECTION I.

##### *On the various uses of Bandages.*

**B**ANDAGES are useful not only for the mere tying up of a wound, but by them many important operations in surgery are performed, more interesting, though less striking, than the cures effected by the knife. In wounds, in abscess, in fistulas, in any general disease of a limb, bandaging is the chief operation of surgery; what the knife cures, it partly destroys; what the bandage cures, it saves.

1st. Although in recent wounds, it is with plasters and sutures that we unite the parts point to point, yet it is with the bandage that we support the limb, preserve the parts in continual and perfect contact with each other, and prevent any strain upon the sutures with which the parts are immediately joined, and we often unite parts by the bandage alone. The Uniting Bandage has been long known by that name. But it is particu-

larly to be observed, that in gunshot wounds, and other bruised wounds, though it would be imprudent to sew the parts, since it is impossible that they should altogether unite, yet the gentle and general support which we give by a compress and bandage, prevents them from separating far from each other, unites the deep parts early, and lessens the extent of that surface which must naturally fall into suppuration.

2dly. Although in the hæmorrhagy from amputation, or in any regular piece of surgery, we trust to ligatures alone; in the hæmorrhagy of wounds, we cannot always find the artery; we dare not always cut the parts, for fear of greater danger; we are often alarmed with bleedings from uncertain vessels, or from members of vessels, or from veins as well as arteries: these are hæmorrhagies to be suppressed by a compress, or sponge, which is but an instrument of compression, serving to give the bandage its perfect effect. Frequently, in bleedings near the groin, or the arm-pit, in the angle of the jaw, wherever the bleeding is rapid, the vessels uncertain, the cavity deep, and the blood not to be commanded by a tourniquet, and where the circumstances forbid a deliberate and sure operation, we trust to compress and bandage alone.

If a compress be neatly put upon the bleeding arteries, if there be a bone to resist the compress, or even if the soft parts be firm below, and the bandage be well rolled, the patient is almost secure\*. But such a roller must be rolled smoothly from the very extremity of the fingers or toes; the member must be thoroughly supported in all its lower parts, that it may bear the pressure above. It is partial stricture only that does harm, creates intolerable pain and anxiety, or brings on gangrene. Hæmorrhagy requires a very powerful compression, which must therefore be very general, and must be made very cunningly and skilfully, to be either supportable or safe; it must not be made only over the bleeding arteries, which is all that the surgeon thinks of in general, nor must it be begun at that part where it is particularly required; the bandaging, for example, by which a wounded artery at the bending of the fore-arm may be cured, must be begun at the very tips of the fingers; each individual finger must be rolled; the roller must be continued over the hand, with the greatest attention to leave not a single point unsupported, nor subject to strangulation. It must be

\* Notwithstanding what is here said in favour of compression, as a remedy for the suppression of hæmorrhage, it ought never to be trusted to where there is reason to apprehend an artery of any considerable size is wounded; particularly where the surgeon is obliged to leave his patient for some considerable time, or resides at a distance from him. Tie the vessels, and then apply compression, and every thing is secure. S.

rolled carefully and firmly upwards along the fore-arm; and thus the whole of the limb will be supported against that pressure which is made, particularly upon the wounded part. When thus rightly applied, the firmer the bandage is, the less apt it is to be attended with pain or danger\*. Gangrene is, you may easily perceive, the effect, not of a firm bandage because it is firm, but because it is partial, and strangles some single point of the limb.

From these considerations, we understand why surgeons failed in the cure of aneurisms, notwithstanding their curious contrivances of plates, and screws, and springs, and cushions; they were too curious, all their care was to make the pressure upon some single point of the limb; and all the fault of their instruments was this partial pressure.

3dly, In ABSCESSSES, where matter is working downwards along the limb (seeking out, as it were, the weak parts), undermining the skin and wasting it, insulating and surrounding the muscles, and penetrating to the bones, the bandage does every thing. The expelling bandage, the propelling bandage, the defensive bandage, were among the names which the older surgeons gave to the roller when it was applied for these particular purposes; and these are properties of the roller which should not be forgotten. It is obvious, that of all bandages the simple roller is the best fitted for a diseased limb†, but the moment you begin to apply this simple bandage, you will meet with unexpected difficulties; you will feel the necessity of use and practice towards rolling a limb with neatness and perfect effect; you will find yourselves awkward at first, and would almost believe, that a simple roller could never be made a perfect support to a diseased joint; you will perceive your bandages to be irregular from the first, and they will be slackened in a few hours. Practice will convince you, that the firmness and neatness of a bandage depend altogether upon these two points, first, upon the TURNS succeeding each other in a regular proportion; and, secondly, upon making REVERSES, wherever you find any slackness likely to arise, from the varying form of the limb. Thus, in rolling from the foot to the ankle, leg and knee, you must take care first, that the turns, or, as the French call them, Dol-

\* I cannot agree with the author in this reasoning: if you apply a bandage with sufficient firmness at the upper part of the limb to stop the circulation, I do not see how pressure upon the lower part will prevent gangrene; and unless the circulation is prevented, mortification will not ensue. S.

† This rule is not admissible in the unlimited degree in which it is here laid down; on many occasions the many tailed bandage is preferable, as in a suppurating compound fracture, and in all cases where moving the limb frequently would be injurious. S.



loires, of the roller \* lie over one another by just one third of the breadth of the bandage ; and secondly, that at every difficult part, as over a joint, you turn the roller in your hand, make an angle, and lay the roller upon the limb with the opposite flat side towards it ; you must turn the bandage so as to reverse it, making what the French call a *Renversée* of the roller, at the ankle, at the calf of the leg, at the knee † ; wherever, upon making a turn of the roller, you perceive that it will fall slack, you make a REVERSE of the bandage, and at each reverse you put in a pin to prevent it falling down ; you must be careful to roll your bandage from below upwards, and support the whole limb by a general pressure, that you may be able to support the diseased part with a particular pressure ; you must lay compresses upon the hollows, and upon the bed of each particular abscess, and change the place of these compresses from time to time, so as now to prevent matter sinking into a particular hollow, now to press it out from a place where it is already lodged, and again to reunite the surface of an abscess already completely formed, from which the matter has been already discharged.



4thly, IN THE CASE OF A FISTULA, or where the abscess has hardened into a callous tube, while you pare away the callous edges, or cauterize them ; while you open particular mouths of the fistula with the knife, or dilate them with sponges (which you should prefer if you are afraid of an hospital sore) ; while

\* The Dolloires are marked in the plate, 1, 2, 3.

† Renverfees of the roller are marked in the same plate, a, b, c.

you stimulate the internal surfaces with gentle solutions of corrosive sublimate, spirits, or stimulant balsams, as solutions of gum, aloes, &c. in spirits; you must lay such a train of compresses along the course of the fistula as will bring the sides into contact; and when you use a seton, whether it be in fistula, to excite the tube, or in irregular abscess, to lead the matter, and concentrate the disease, you learn by means of the seton the direction of every irregular passage, and hollow tract in the limb, and know, of course, where to lay your train of compresses, and what form to give them.

It is in the complicated case of a swelled and diseased limb that we are sensible of all the uses of a bandage, which is a universal cure for all its disorders. By the bandage we dissipate the leucophlegmatic swelling, abate the inflammation, prevent the extension of matter, lessen suppurating cavities, close the walls of fistulas, procure the reunion of surfaces which have suppurated. The patient is sensible of an easy and pleasant firmness from the bandage, and the limb is actually supported against accidents, and the further extension of the disease. This effect of bandage is observable, not merely in this single case of an ill bandaged limb, but is equally obvious and interesting in other cases; for in varices, though a permanent bandage is usually required, yet sometimes the parts are so strengthened by a roller that they recover their tone. It is also by curing this low inflammation, restoring the tone of the parts, and strengthening their action, that bandage cures ulcer in the leg. If you have seldom seen an ulcer even rendered stationary by a bandage, much less cured by it, remember how very ignorantly you have seen such rollers applied. You have seen them drawn round the ulcer, round the shin alone, with the firmness of a tourniquet; the middle of the leg bound very tight, the foot swelled, the ulcer inflamed, the marks of the roller left in large ridges; you have seen it recovering in the morning, only to be tortured into the same condition before night! Instead of this it should be rolled from the very extremities of the toes, and then roll it as tight as you will you can do no harm. It should be rolled in the morning upon rising from bed, in such a manner as to fit it to bear the fatigues of the day; to support and defend the ulcer, and keep the swelling all above the sore; this constitutes the true value of the sticking plasters, which have been so successfully used by Dr. Bainton: First, The sore is thoroughly cleansed, its edges smoothed and wrought forwards, and firmly compressed by the drawing of the plaster: Secondly, The limb is rolled from the toes to the sore, then over the sore, and some way upwards, so as to secure the relaxed parts; the bandage so rolled, by a skilful hand, is the only certain cure; neither oint-

ments, nor mercurial preparations, nor sponges, nor leaden plates, will cure an ulcer: it is to be cured only by firm, equal, and perfect compression, which must be renewed more than once a day if the bandage becomes loose. There is no inflammation of the lower extremities in which I do not experience the good effects of firm rolling. Even mere feeling and vulgar experience instruct a man when he has an ankle sprained to bind it firm; and in a diseased bursa (as in a relaxation of the knee joint), that disease, which with but a little indulgence, a very little encouragement of fomentations, poultices, bleedings, and low diet, would end in white swelling of the knee; may be stopped even by so simple a matter as a well rolled bandage. Stimulants, as calomel, opium, and good diet, will keep the system well; and the joint itself may be excited to a healthy action, by pouring hot mineral waters on it, by animal oils, camphor, laudanum, frictions, and most of all by supporting the action thus excited by a general roller, well and carefully applied, and by particular compresses applied upon each bursa. By a compress, merely on each side of the knee joint, when the great Capsule of the joint itself was swelled, I have reduced the size of a dropsical knee by the quantity of three or four ounces in a night's time; the fluid being fairly and unequivocally absorbed, without any deception arising from its being pushed into the surrounding cellular substance. I have frequently in a few days reduced prodigious dropsical swellings of the knee, relieved the patient from great pain, restored the use of the limb, and made an absolute and permanent cure. The common sprain of the ankle also is a slighter disease, a temporary one of those bursæ which accompany the Peronæi tendons. It seems to be accompanied with very quick and active inflammation; if it be but a little indulged by long fomentation in tepid water, leeches, poultice, and such things as relax the parts, it is rendered a very tedious disease, and the joint becomes swelled and gummy, lame for months, and rheumatic for years, and liable to be easily hurt again by the slightest strain upon it; but if this swelling be opposed vigorously by hot fomentation, continued but for a short time, camphorated spirits, a very firm bandage, and long compresses firmly pressed down behind the ankle, and if after a few days cold water be poured upon the joint, if it be rubbed, and still firmly bandaged after it seems well, it will be easily cured, and no remaining weakness left to remind us of the accident.

I have reduced all bandages to those few which are represented at the head of this chapter. They are as follow.

The LINTEUM SCISSUM, or Split Cloth, marked No. 1. is peculiarly adapted to the head: it covers the whole scalp, and



its legs or split parts tie firmly round the occiput and forehead ; it may be made with six or with eight tails, according to the parts you wish to compress\*.

THE SINGLE SPLIT CLOTH, or bandage with four tails, No. 2. which is called the CAPISTRUM or Stirrup, or the FUNDA or Sling, is the proper and peculiar bandage for the face : in cuts of the forehead, or of the face, of the nose, of the lips, in fractures of the jaws, and in every wound which is beyond the circle of the hairy scalp, we use the Sling, or Double-tailed Bandage.

THE T BANDAGE, No. 3. which is named from its resembling the letter T, is the peculiar bandage of the body. If the breast or belly be wounded, we make the circular (a) very broad, which serves as the proper bandage of the body, and we split the tail-part, (b) and passing one leg over each side of the neck, we pin it to the circular, so that it forms a suspensary for the main bandage, which prevents its slipping down. But if we have a wound, or disease, or operation near the groin or private parts, the tail-part becomes then the most important part of the bandage ; then the circular is smaller, and goes round the pelvis, while the tail-part is made very broad. When the disease is in the private parts, perineum or anus, we often split the tail according to circumstances ; but when the disease is in one groin, we generally leave the tail-part of the bandage entire and broad.

THE ROLLER, No. 4. is the peculiar bandage of the limbs, for accomplishing all those objects which I have just explained to you ; it serves for the limbs, shoulders, haunches, and occasionally for the body ; it is often singularly useful in bandaging the head, where peculiar firmness is required, and there always you are to use the double headed roller†. You take one head of the roller in each hand, and by that which is in your left hand, you fix down the turns of that which is in the right, so that you can make your bandage smoothly firm over the whole head, can knot it at particular points, can turn it in every direction, and fit it to every occasion. Wherever the roller is to be used as a uniting bandage (i. e.) to be applied round any part, so that the legs meet and cross each other over a wound (to draw its lips close together), we make a slit in the roller, see No. 5. and pass one of the rolls through it, and thus we make the decussation of the bandage very sure, and give it peculiar effect upon the

\* Marginal plate at the beginning of this chapter.

† In all injuries of the head, which render bandaging necessary, a double headed roller is by far the best : generally a common night-cap will confine the dressings, and answer the purposes of a bandage. S.



wound. These are the four bandages which I proceed to describe, and I believe I shall satisfy you that you may throw aside every other.

## SECTION II.

*Of the four-tailed Bandage or Single Split Cloth.*

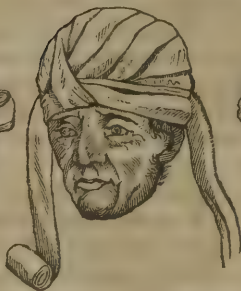
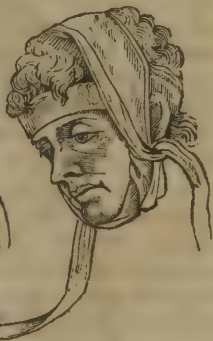
The Four-Tailed Bandage, or Single Split Cloth, is the peculiar bandage for the forehead, face, and jaws; if the forehead be the part wounded, this simple and very convenient bandage is applied as in fig. 7. The bandage is made by taking a strip of cloth not quite so broad as the palm of the hand; it is to be torn or split up at each end, so as to leave only a convenient length of the bandage entire to be applied to the wound; the middle or unsplit part (a) is applied to the forehead, one tail (b) is carried round the back head to meet its fellow. The other tail (c) is carried, as seems best, either upwards over the crown of the head, or downwards so as to tie under the chin.

If the top of the head or sinciput be the part wounded, the bandage may be applied, as in fig. 8, laying the unsplit part (a) upon the wound, making one tail (b) pass down under the chin, while the other (c) is long enough to go round the head like a fillet, so as to secure the bandage from slipping backwards and forwards. It may go round to the occiput only, or it may go round the occiput and return to the forehead, and tie there.

In cuts of the lip or nose, or both, after putting proper stitches in the nostril, lip, &c. we apply the funda or sling, as in fig. 9.; we make one small opening to receive the tip of the nose, and we do not forget to make two small holes opposite the two nostrils for breathing. If the nostril or the tip of the nose be much wounded, or almost cut off, after putting in one or two stitches with the needle, we wrap lint neatly round the quills to put into the nostrils. The quills serve for breathing through, and the lint dilates and pads up the nostrils, so as to keep the nose in its proper shape, and by distending the nostril it keeps the parts in very nice and equal contact; one tail of this bandage ties at the nape of the neck, the other crosses its fellow at the back of the head, and then turns round to meet it, and to tie on the forehead; and sometimes the lower part also is brought round to tie at the forehead. If the upper lip be cut, and a bandage needed (which seldom is the case), it is almost superfluous to say that this bandage will serve the purpose. It serves also in cuts of the lower lip, though there also we trust rather to hare-lip pins than the bandage; but this bandage is particularly useful in supporting the lower jaw where it is broken. This bandage, when applied thus to support the lower jaw, is named *Capistrum* or *Bridle* (as it goes round the jaws somewhat like a horse's halter). In some cases the circumstances require us to support the chin particularly, and then the unsplit part of the bandage is applied upon the chin, with a small hole to receive the point; but where the jaw is broken, we pad up the jaw-bone into its right shape, with compresses pressed in under the jaw, and secured by this bandage; where we are in fear of hæmorrhagy after any wound or operation near the angle of the jaw, we can give the sling a very remarkable degree of firmness. For this purpose, we tear the band into three tails on each side, we stitch the bandage at the bottom of each split, lest it should give way when firmly drawn, and having laid our sponges first into the bleeding parts, and then laid compresses above them, we make the tails of the bandage depart from each other, just over the point where the danger is, as in fig. 10. where two tails (a) turn round under the occiput, and are tied there; two others (b) cross each other a little higher, come round by the temples, and tie upon the forehead; and the two other tails (c c) may

either tie upon the top of the head, or return and tie under the chin. In those cases, strong and firm pressure being required, it is not amiss to have two legs of the bandage long enough to be just twisted at the top of the head, and to return and tie under the angle of the jaw with a firm knot. But for purposes like these, viz. of suppressing hæmorrhagy after operations, or supporting a broken jaw, or plugging up a gunshot wound where there is great hæmorrhagy, such as we cannot command with the needle, there is a certain form of the double-headed roller, which I shall presently recommend in preference to this; it is named the Knotted Bandage.

## SECTION III.

*Of applying the Roller to the Head and Jaws.**Fig. 11.**Fig. 12.**Fig. 13.*

But the Roller is the universal bandage; it supplies occasionally the place of all those which are peculiar to the head or face; is applied to the head in the following manner; 1st, As a uniting bandage. When the cut is, for example, on the forehead, the two heads of the roller are crossed over the cut, by passing the head at one end, through a noose in the other end; and I find it of infinite advantage to touch either the roller itself, or the skin near the cut, with some adhesive plaster, which gives the roller a firm hold upon the skin, fig. 11. where the roller is supposed to cross over a wound.

2dly, In great lacerations, or in extensive suppurations of the

scalp, the general pressure which such a case requires, may be made by turning the double-headed roller with both hands round the head; and while the right hand surrounds the head with circular turns, the left hand crosses the top of the head at each turn of the roller, and, when finished, it makes the bandage which is drawn, fig. 12. It is called the **CAPELLINE BANDAGE**, and is the same with that which was a few years ago used for binding up a stump after amputation.

3dly, When the jaw is broken, the double-headed roller keeps the parts very firm, and this bandage winds in every direction which the exigencies of the case may require; for whenever you wish to turn the bandage to make it peculiarly firm, you have but to cross the rollers, and change hands. But there is nothing so peculiar in this form of bandage, nor so far differing from the capistrum, or split cloth, as to need a drawing.

4thly, In every case of dangerous bleeding from about the jaws, the parotid gland, the ear, &c. I prefer that form of the double-headed roller which is seen in fig. 13. when at each turn

*Fig. 14.*



you twist and knot the bandages over the point where the danger is ; whence this form of the roller is called particularly the **KNOTTED OR TWISTED BANDAGE.**

## SECTION IV.

*Of Bandage for the Body.*

The best form of bandage for the body is the very old one, represented in fig. 14, named *Spica*, because, when made, it resembles somewhat an ear of corn. We begin the bandage at (a), by laying the middle of a double-headed roller in the axilla ; we carry the two heads first round the body, then obliquely up over the breast and back, and make them cross each other over the shoulder, (b); both heads are then carried round the affected arm at (c c), then up again over the same shoulder, and cross upon the top of the shoulder, and then down again over the breast and back, so as to make a second turn (d) under the sound axilla, and then the roller is returned over the breast and back a second time to the affected shoulder. This *spica* bandage is sufficiently explained by the drawing ; it is often made over both shoulders, and is then called the *Double Spica*, being made with equal crossings on the breast and back, and equal crossings upon each shoulder, both over and under it. This bandage is also used in approaching the trunk of the body from the thigh : the bandage is then called *Spica Inguinalis*, the *Spica* of the Groin, and begins with a turn round the pelvis.

This *spica*, in various forms, sometimes turning more particularly round the pelvis, and sometimes turning chiefly round the limb, according as the trunk or the limb is most wounded, makes a very firm bandage. In fractures of the clavicle,\* in wounds about the upper part of the breast, in hæmorrhagies from the mammary arteries at the top of the breast, in fractures near the head of the shoulder-bone, in amputations very close to the trunk of the body, we find this bandage, the *Spica Humeri*, very useful. The *spica inguinis* is equally useful in hernias of the groin, in luxations of the thigh bone, in wounds of the upper part of the thigh, or lower part of the belly, in

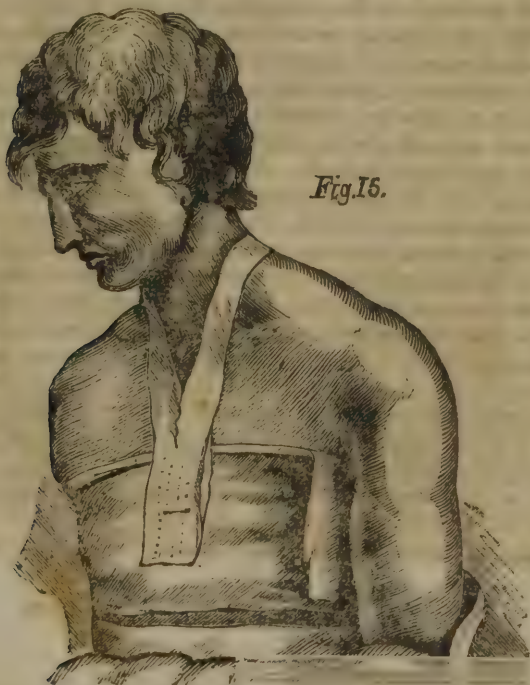
\* In applying this bandage for a fractured clavicle, it is necessary to raise that part of it attached to the scapula, until it is put into complete coaptation with the sternal portion. This is to be effected by elevating the humerus, and a few turns of the roller, including the body and arm, will retain it in its proper position. For a more effectual but complicated apparatus for fractured clavicles, vide *Default's Œuvres Chirurgicales*, vol. i. p. 93. In *Boyer's Lectures, on the Diseases of Bones*, p. 72, Phil. edit. there is a more simple plan recommended. The *spica* bandage will answer all purposes if properly applied. 3.

supporting aneurisms of the femoral artery, and in a thousand indescribable cases.

3dly, When the thorax is wounded or diseased; when the ribs are much broken; when the sternum is carious, with supuration; when a schirrous breast has been extirpated; when we perform the operation for empyema, (that is, when we make an opening to let out matter confined within the chest); we use the Napkin† and Scapulary, fig. 15. It is called Napkin and Scapulary, because in general it is made by taking a table napkin, folded lengthways four or five times; which being put smoothly round the body, and pinned firmly, is suspended by the scapulary, so named from its lying flat over the shoulders. The scapulary part of the bandage is just a slip of linen split half its length, so that its two legs being laid round the neck, the unsplit part before is pinned to the circular or napkin; and the two legs being made to cross each other behind, are also pinned to the circular, one on one side, the other on the other side.

The T bandage, belonging to the groin or private parts, is so continually used, while almost all other bandages are neglected, that it would be as superfluous to explain it, as it is useful to explain the others.

† A broad roller passed several times firmly around the body, would, I think, answer better than the napkin. S.



*Fig. 15.*

## DISCOURSE IV.

## ON HÆMORRHAGY.

*Preliminary Observations.*

TO expire by successive hæmorrhagies is perhaps the least painful of deaths, and yet it is the most awful. The repeated loss of blood so directly intimates approaching dissolution, and the patient feels his spirit and strength ebbing so perceptibly at each return of hæmorrhagy, that he clings to life. Those of the most resolute mind are overcome with anxiety which they cannot conceal, and look round for some one to delay at least the fatal moment: and the surgeon feels himself so responsible, that with him it is truly an anxious scene. If the bleeding be slow and gradual, from some extensive surface, as from a polypus of the nostrils, from the womb, from the surface of a stump, or from some extensive sore, the surgeon is sent for from hour to hour; he is called during the night; he is made unhappy for weeks; and, after repeated uncontrollable hæmorrhagies, he sees his patient expire. But, if there be a sudden hæmorrhagy from the vessels cut in any operation, or from an aneurism, or from some great wound, the arteries of which cannot be discovered, there is immediate danger of the patient expiring even in the surgeon's hands.—Let those who have witnessed the agitation of such scenes judge of the importance of that subject which I am now to explain to you; indeed I may appeal directly to yourselves! Is not this fear of hæmorrhagy always uppermost in the mind of the young surgeon? Were this one danger removed, he would go forward in his profession almost without fear.

Let us then consider the following points of doctrine, with the practical inferences that are to be drawn from them: First, The natural causes by which an hæmorrhagy is stopped; se-

condly, The artificial means of arresting an hæmorrhage ; and, thirdly, The condition of an artery when tied with a ligature.

## SECTION I.

*Of the natural Causes by which an Hæmorrhagy is stopped.\**

When an artery has been tied securely, we are, from that moment, free from all uneasiness ; but when it stops merely by pressure, by astringents, by the formation of clots, by the contraction of the artery itself, whenever hæmorrhagy stops from any natural cause ! it is apt to return ; and we inquire anxiously into those natural causes for this reason. When hæmorrhagy stops of its own accord, it is neither from the retraction of the artery, nor the constriction of its fibres, nor the formation of clots, but by the cellular substance which surrounds the artery being injected with blood ; and to be assured of this, we have but to observe, what happens in arteries of various sizes. First, Let us suppose the wounded artery to be so small as just to spurt out its blood ; the stream of blood gradually lessens, because the artery is emptied, and the resistance to the arterial action taken away ; the stimulus being gradually lessened, the artery every moment acts less powerfully ; and the blood being no longer solicited or urged on by the arterial contractions, forsakes the open artery, and moves along the neighbouring branches. The surgeon claps the point of his finger upon the mouth of the artery, and holds it there ; the outward bleeding is prevented ; the blood is extravasated into the cellular substance round the mouth of the artery ; the cellular substance is slightly injected with blood ; that blood coagulates ; and this slight barrier is sufficient to restrain the bleeding of a small artery, till the parts inflame, and the artery is entirely stopped.

Secondly, Supposing the artery still larger and more powerful, and that it drives its blood very furiously among the cellular substance, it is not this slight injection of the cellular substance that will restrain the bleeding ! The injected cellular substance will not support the artery, unless it is itself also supported. Suppose then that the surgeon first claps his thumb firmly upon the artery, and then thrusts down a piece of sponge close to the wounded artery, applies over that a compress, and bandages over all to support the sponge and compress in their place ; the artery still bleeds (though in a restrained way) both

\* Vide Appendix A.



into the cellular substance beneath the sponge, and into the sponge itself, till at last the blood coagulating in the sponge, and in the cellular substance, they become as one mass, and often the sponge keeps its place till the parts inflame and suppurate, when, of course, the wounded artery heals along with the other parts.

Thirdly, But often it happens that the blood, which was at first firmly coagulated, begins to lose its consistence; or that by some unwary motion, or by a febrile excitement, the artery acts violently; more of the cellular substance is filled with blood, and the first firm coagulum and the sponge being removed from the mouth of the artery, the softer cellular substance behind them is filled with fluid blood, and the artery, forcing that slighter obstacle, bursts out again.

## SECTION II.

### *Of the artificial Means of suppressing Hæmorrhage.*

Styptics, caustics, and cauteries,\* aided by compression, were the only means of suppressing hæmorrhage, which the older surgeons possessed. These have now been almost entirely superseded by the needle and ligature, for the discovery of which we are indebted to Ambrose Parée.† This was a discovery

\* Mr. Astley Cooper, of London, mentions in his lectures a case in which the actual cautery was successfully applied to the artery which passes through the foramen incisivum, when no other application could stay the hæmorrhage. Mr. Hey, of Leeds, I have been informed, uses the same remedy in hæmorrhagies from the tonsils.—S.

† Agaric, Bovista, or Puff-ball, was strongly recommended some years ago as a substitute for the needle and ligature; but pressed sponge, which has been chiefly used by the celebrated Mr. White, is more useful than the agaric; it is like it in its operation, is really of value in practice, not to take the precedence of the needle, but to assist it. The sponge can be very thoroughly dried, it can be compressed into a very small compass, it can take any shape, and may be thrust down into cavities and narrow wounds, where the needle cannot go; it can be made so hard, and pressed so firm, by laying compresses over it, as to have at once the effect of a compress and of a sponge; or rather of a compress having this curious property, that at first it presses moderately, but if one drop of blood escapes, the compress swells by absorbing that blood, still preserves its contact with the bleeding artery, and swells more, and presses harder, exactly in proportion as such pressure is required. This is plainly the effect of a sponge, whether it be nitched in betwixt two bones to compress an artery, which the needle cannot reach; or whether it be laid flat upon an open sore, as after cutting out the breast; or after an amputation done according to the old fashion, where the surgeon used to dress his stump open, and to heap compresses, tied with a firm bandage, above each piece of agaric or sponge. The agaric, possessing a degree of this property, is of use; even our common lint possesses this quality of absorbing and swelling in a slight degree. But the agaric and sponge are both so excellent in this respect, that even those who are the least inclined to use them, must acknowledge, that though the

which set him higher in surgical, than Harvey is in medical science, and it is altogether his own. Had this invention been well received, it must, in the course of two long centuries, have improved surgery very greatly, and saved innumerable lives. It would have rendered many operations practicable, which the older surgeons never ventured upon; and have made those operations safe, which were not so till of late years.

Parée neglected nothing which could give effect to this important discovery. He tried to demonstrate, that even the ancients would have approved of the practice. He also supported his reasoning by facts; by his amputations, and other operations, and by his successes in the most dangerous wounds. Nor can we observe, without surprise, how perfect his operations were, even in the infancy of this discovery.

Parée had three general ways of tying an artery; by passing the needle round the artery, down on one side, and up on the other, and so tying in along with it a quantity of flesh; or, by drawing the arteries out from the wound, as from the face of a stump, by the artery forceps with a spring handle, which he called Va-

garic will often fail, it has yet enabled surgeons to perform the greater amputations safely; and the sponge, as is proved by Mr. White's Practice, is the only thing that can stand by the side of the ligature to assist it. I am sensible, that by thrusting down a sponge I have saved a patient's life, when I could not have extricated myself by any nicer operation. The sponge is often more useful than the needle, and that, too, in cases of the greatest danger. Wherever the wounded artery lies deep, and we cannot cut for it, on account of the nearness of some great artery or important nerve, as, for example, in the axilla, about the neck, or about the angle of the jaw; wherever the bleeding artery is so nitched in between two bones that we cannot draw it out with the tenaculum, nor reach it with our crooked needle, as, for example, in the fore-arm, or between the bones of the leg: in short, wherever we cannot see the artery, or cannot strike it safely with the needle; wherever the bleeding is not so much from a particular artery as from a general surface; or wherever the blood is thought to flow rather from great veins than from arteries (as in tearing out cancerous glands from the arm-pit) in all such cases we use the sponge, and we use it in the following manner: We keep the sponge dry, and hard compressed, and always ready for use; and when it is to be used, it is cut into small pieces, square or long, as the incision requires, and small threads are tied to the sponges, by which they may be drawn away in due time. In any dangerous hæmorrhagy of this kind, we choose out a piece of sponge proportioned to the size of the wound, thrust it down to the bottom of the wound, fix it there with the point of the finger, either expressly upon the mouth of the bleeding artery, or, if that cannot be distinctly seen, upon the place at which the artery bleeds; then lay one compress above the sponge, a second compress above the first, a third above the second; and taking care to keep the compresses always steady with one finger, to prevent the blood soaking into the first sponge, and distending it, we pile one compress above the other, till the whole rises so above the level of the wound, that our bandage operates well upon the whole of this pile, which is called *Graduated Compress*.

I advise you, on such occasions, to keep your tourniquet screwed during the whole operation, that you may not be troubled with blood; to slacken it slowly, that the dressings may not be discomposed by the too sudden return of blood; and still let your tourniquet remain loose about the limb, and ready to be screwed, if the artery should bleed again.

let a Patin ; or by striking the needle above the place of the wound, through the flesh of the limb, down quite to the bone, so as to tie in the great artery of the limb, and along with it much of the flesh.

“ If there be a bleeding artery, says Paræus, in any wound, dress the wound with astringents ; but be careful at the same time to lay a firm compress over the wound, and settle it well with a bandage, and then lay out the wounded limb in an easy way.

“ If this do not serve, clap your finger upon the point of the artery, and wait patiently till a clot be formed.

“ If the artery continue to bleed, cut up the wound, (if it have been sewed) and pass a needle under the artery, enclosing along with it in the ligature much or little flesh, according to the circumstances of the case.

“ If the artery have shrunk up among the flesh, cut up the wound, and tie the artery higher.

“ But should both ends of the artery have been still further retracted, then continue your incision, and cut open the skin freely, still pursuing the artery ; but still careful of the very artery that you are pursuing, lest you should cut it a second time.

“ In an amputated stump, draw your arteries out with the forceps, tie them neatly with a thread ; but if once you miss the artery, or your first thread give way, do not use the forceps any more ; but pass a needle four inches long into the stump, so as to tie in the artery, along with much of the flesh.

“ These ligatures we are careful not to withdraw too early ; nor must they ever be removed till the granulations of flesh have grown up to protect and strengthen the artery.

“ If these operations fail, we must have recourse to caustics, vitriols, or the actual cautery, which make eschars and crusts ; and we must be careful to prevent these eschars falling off till the flesh be formed.

“ Sometimes also the surgeon needs to cut the vessel entirely across, by which its ends, shrinking both ways among the flesh, the flux stops : but always the surest way is to tie the vessel before cutting it thus across.”

This is a system of instructions which is fairly extracted from Paræus's books, without mending the text, and though this system be now one hundred and fifty years old, it is such I believe as the best surgeon at this day in Europe could hardly improve. In correctness of practice, surgeons, from his time, went backwards for many ages ; and it is only after much experience, and by very slow degrees, that we have learnt at last, that the drawing out an artery, with the forceps or tenaculum, and the tying it fairly with a small ligature, the method which appeared to the



older surgeons to have every fault, is absolutely the most secure.\*

## SECTION III.

*Of the condition of an Artery when tied with Ligatures.†*

This, far from being an idle speculation, is, I trust, an inquiry which will lead to very important conclusions; for we naturally inquire, first, How the artery, (when tied as in the operation of aneurism), is affected by the two ligatures which are put round it? secondly, How the open artery of a stump is affected by the single ligature with which it is tied? and this leads directly to a very interesting inquiry, viz. How the accidental bursting of arteries is to be prevented, and from what causes secondary hæmorrhagies arise?

An artery is part of the living system: it has its vasa vasorum, its arteries, veins, and lymphatics, for the growth, support, and nourishment of its own coats. Its circulation and nourishment are according to the common laws of the system; and having this apparatus of active vessels, it is connected with the surrounding parts by the common cellular substance, by lesser arteries and veins, and the division of that cellular substance, or of the artery itself, is as much a wound, as an incision in the skin is!

*Pathology of an Artery tied with Ligatures.*

When ligatures are applied round an artery, they operate by making the several points of the arterial canal pass through the various degrees of inflammation, from adhesion in one point, to gangrene in another. The space included betwixt the liga-

\* By this means we avoid including in the ligature the large nerve which usually accompanies every large artery: a circumstance of no small importance. Vide what is said on Secondary Hæmorrhage. S.

† Vide Appendix B.



tures falls into gangrene, the space immediately under the stricture of each ligature adheres; this adhesion prevents the gangrene or the inflammation passing along the higher parts of the arterial canal; but the inflammation affects the arterial tube a little way upwards and downwards, so as to thicken its walls and contract its cavity, whence the canal of the artery is obliterated a little way beyond the exact place where it is tied.

The pathology of a tied artery is thus reduced to common principles; the obliteration and adhesion of a wounded artery, is truly compared with the reunion of any other wound; and one subject of inquiry alone remains, the most important perhaps in surgery, "What are the causes which prevent the adhesion and obliteration of an artery, and produce ulceration in its coats?" for the causes which thus produce ulceration and prevent adhesion of the artery, occasion those secondary hæmorrhages of which so many patients die! We never leave our patient bleeding, yet it often happens, that in the course of a few days after an operation for aneurism or an amputation, the blood bursts out suddenly and our patient bleeds to death! Direct hæmorrhagy from a recent wound is easily suppressed, for we see the artery and can tie it; but this secondary hæmorrhagy is peculiarly dangerous, it comes upon us when we are least aware of it, the parts are ulcerated, or mortified, and the bleeding artery can be with difficulty found.

#### SECTION IV.

*Of the causes of secondary Hæmorrhagy; and, first, of bursting of the Artery from the diseased state of its coats.*

The bursting of an artery after it seems securely tied, arises sometimes from the unfavourable state of the artery, and from its being incapable of adhesion, but much more frequently does it happen from that process which should terminate in adhesion of the artery, proceeding to inflammation, and ulceration of the arterial coats. The diseases of the arterial system have not been sufficiently investigated! there are few people who have passed their grand climacteric without having the condition of the whole arterial system very remarkably changed. The extreme arteries, the active arteries, in all parts of the system, are less affected, they preserve their natural pliancy; but the great arteries which serve but to conduct the blood, and whose contraction is less important to the existence of life, are remarkably affected. We are sensible towards the decline of life, of changes in the great arterial trunks, plainly unfavourable to our

operations; the cellular substance which joins the coats of the arteries is diseased; the whole tube is but ill disposed to pass through those changes which are familiar to the other soft parts. They do not inflame, adhere, thicken, and obliterate, as sound parts do! In dissecting an aged subject, we always find the arteries less pliant, sometimes they are contracted, sometimes enlarged, they become white, and their coats thickened and less connected with each other, separate like the coats of an onion into ten or twelve, or into innumerable lamellæ; they are at the same time brittle, and fragile, and have a crisped feel; they are sometimes ossified; they break or crack when we attempt to bend them; and the drawing of a ligature round such an artery tears it from want of pliancy! our anatomical injections are successful only in very young subjects; while in older subjects the arteries burst because they have lost their strength; or tear under the necessary ligatures because they have lost their pliancy! the anatomist knows by the first touch of the femoral artery, for example, whether his subject will bear to be injected! and the surgeon in like manner often foresees by the first touch of his finger, those burstings of the artery and secondary hæmorrhages of which so many have died.

Thus it often happens, that the artery, too hard to bear a ligature, breaks and tears across in the very moment of drawing the ligature; the artery must no doubt have been in this condition, which gave the celebrated Petit so much trouble and anxiety in the case of Mr. Seneuze the bookseller. Mr. Petit having amputated this gentleman's thigh, found that the femoral artery was nothing affected, neither by the tourniquet nor by the ligature; and he was obliged in the end to suppress the hæmorrhagy by compresses piled upon the face of the stump, and braced down with very firm rollers. It must also have been an artery of this kind, by the bursting of which Mr. Acrell had almost lost his patient; for the artery did not stand the ligature one moment, but in a manner burst under his fingers! The case is as follows:

“ A soldier, of a scorbutic habit, extremely weak and convalescent, was stabbed unfortunately with a pointed knife in the femoral artery, about seven inches below Poupart's ligament; and the wound bled so furiously that he fainted: a physician, who was called, bound it up so effectually with compress and bandage, that he stopped the bleeding for twelve days; but the blood burst out again on the thirteenth day; notwithstanding which, the outward wound healed, the aneurismal tumour was distinctly formed, and by the twentieth day it beat very strongly, threatening rupture. Acrell thinking the aneurism too large to be cured by compression, proposed to tie the artery; he

opened the tumour; scooped and washed out the very black and fœtid blood, and exposed the artery, which he found dilated for about four inches into a large sac of about three quarters of an inch in diameter. He then tied the artery with one ligature above, but behold while he was drawing the lower ligature, the artery suddenly burst above the upper ligature, and threw out its blood with such force, that in less than a minute the man had lost fully four pounds of blood." This artery tore under the pressure of the ligature; the tourniquet could not command the hæmorrhagy; the ligature itself was ineffectual. In these distressing circumstances, Acrell at last suppressed the hæmorrhagy by sponges and compression! with these he "filled up the whole cavity of the aneurism; and to ensure a proper compression, he made a sheath for the thigh, of white iron, with a globular compress upon its internal surface, adapted to the place of the wounded artery." Thus he accomplished the cure, and the case is a singular example of the artery in that very state which I have described breaking under the ligature! giving way in the very moment of the operation.

## SECTION V.

*Of bursting of the Artery from Ulceration of its Coats.*

Yet it is not to this unhealthy condition of an artery alone that I ascribe the death of those who have perished from secondary hæmorrhagy. The diseased state of the arteries never can explain the difference of danger in the two operations of aneurism and amputation. In amputation of the thigh we tie the great femoral artery; we tie also the profunda, and its muscular branches; we perform amputation daily, and we tie many great arteries in each amputation; each ligature is seen moved and raised up from the face of the stump at every pulse of the artery; the stump remains open. These arteries continue for weeks to bear the whole force of the circulation, unsupported, yet they rarely give way.

But, in the operation for aneurism of the thigh, the difference of security is very great; for this operation is, on the other hand, so full of uncertainty and danger, that hardly any case can be mentioned in which the surgeons have not been alarmed, and the patient in great danger, from secondary hæmorrhages: it is an operation never performed but by surgeons of the first eminence; and yet more, perhaps, have died than have survived it\*. Hunter himself has lost his patients: those

\* The success attending this operation has been much greater of late. S.



whom he did save were endangered by secondary hæmorrhages; and the celebrated Mr. Pott, from the ill success of one operation, was forced to amputate the thigh. It behoves us then to inquire, What the difference is betwixt tying the femoral artery in aneurism, an operation so full of difficulty and danger, and tying the same artery in amputation, an operation which is so perfectly safe, that the death of a patient by hæmorrhagy would be a flagrant disgrace."

SECONDARY HÆMORRHAGY arises from ULCERATION of the ARTERY more frequently than from any other cause! In amputation, such ulceration rarely happens, except when the ligatures, having been firmly tied round the nerves, are prevented from slipping off, or when the whole surface of the stump falls into disease, and is eroded; but in aneurism it is peculiarly frequent, from the manner in which a great length of the artery is insulated and detached from the surrounding parts. If the surgeon, forgetting how slight a force suffices for suppressing the pulse of a naked artery, and for laying its sides in contact, pulls his ligature with all the firmness which the artery can bear, although the artery be not immediately cut across, its coats may be twisted and weakened; or, though not even weakened, they may be so violently compressed that not only the portion of the tube intercepted between the two ligatures, but the part immediately under each ligature will fall directly into gangrene in place of adhering, so that, on the third day, when the ligature is withdrawn, it may bring along with it the end of the artery†.

If the surgeon, in place of dissecting the artery fairly, passes his needle under it, and includes much of the muscular substance, or other soft parts, there is little pressure upon the artery, there is no adhesion of it under the ligatures, there is no amputation of its intercepted part, the cellular substance and muscular flesh fade and give way on the third or fourth day: But the artery itself is still entire, and the blood, by this slackening of the ligatures, passes along the canal of the artery, and out at the wounded point; and as the structure of the artery is but little affected by so slack a ligature, the artery continues entire, the ligature keeps its place round the artery, and, though it does not compress the artery, it irritates it, and is never disengaged till the artery falls into ulceration and bursts.

If the surgeon should pass his needle any considerable distance from the vessel, he will include not flesh only, but will

† From the observations of Dr. Jones, it would appear that there is not so much danger to be apprehended from drawing the ligature with a considerable degree of tightness as Mr. Bell seems to suppose. The ligature ought to be tied tight enough to divide the two internal coats of the vessel, and the surgeon had better err on that side, than incur any risk of having the ligature thrown off. S.



take the nerve into the loop of his ligature ! for every great artery has a great nerve of the limb accompanying it, the brachial artery has the great radial nerve, the femoral artery has the great anterior crural nerve, the great artery, nerve, and internal veins of each limb, lie in a peculiar sheath, and, in order to tie the artery apart from the vein and nerve, it is necessary to dissect this peculiar sheath of cellular substance. Now, authors have always talked slightly of tying the nerve, as if the tying it related only to the nerve itself ! No ! it relates to the security of the artery ! an artery, tied with a ligature, is destroyed in a few days, but a nerve tied with a ligature is hardly affected by it : The nerves are peculiarly strong, their coats hard and firm ; a ligature tied round a nerve and artery together, as it cannot destroy the nerve, keeps its hold upon the artery, till, by the irritation of the ligature, and other obvious causes, it ulcerates and bursts ;\* or, if this can be prevented, it is only by cutting the ligature timeously away, which cannot be done without a degree of difficulty and danger.

But there are still other causes of the ulceration of arteries. If the surgeon, anxious to insure the obliteration of the artery, resolves to lay a considerable length of the sides of it in contact, what does he do but insulate the artery, tear it up from its bed among the cellular substance, separate it from all those vascular connections which kept it alive ! he exposes it to almost inevitable ulceration ! This has been practised upon the femoral artery in a great variety of ways, all of them ingenious, but all in direct opposition to the principles of surgery. These contrivances for insulating the artery are sure to cause that ulceration which too many natural causes conspire to produce ; and it is this ulcerated state of the artery that makes it necessary to apply successive ligatures, and the same causes make these ligatures, in their turn, give way. As far as possible then, to avoid insulating the vessel, I would tie it clear of the nerves, which, being indestructible, hold the ligatures too long :

\* The following experiment, which is extracted from Jones, p. 179, very remarkably confirms what is stated in the text.

" In the month of September, 1756," says Ponteau, " I tied the crural artery of a dog of moderate size with a ligature, which likewise included the nerve of the same name ; the artery was not opened, and the animal was left to itself. On the fourth day there supervened an hæmorrhage, which stopped of its own accord : on the next day it recurred, and was so profuse that the animal died. Upon laying open the artery lengthwise, I found it open at its anterior part, immediately under the thread of the ligature ; there was in its cavity a clot of a pale red colour, of a moderate confistence, and in the form of a spindle : the superior extremity of the coagulum floated in the artery above the ligature ; the middle portion was lightly attached to the posterior part of the artery under the ligature ; the inferior portion, which was the most slender, floated in the artery below the ligature ; this coagulum was about four lines in length, and less than a line in diameter, at its thickest part." Ponteau *Mélanges de Chirurgie*, p. 80.—S.

I would also have it clear of the muscular flesh, which prevents the ligature from having its full effect upon the artery; and with a ligature smaller than the one commonly used, I would tie the vessel, with moderate firmness, as near as possible to the sound parts.

#### CONCLUSION.

Thus have I endeavoured to investigate, in a general way, the causes of secondary hæmorrhagy: I ascribe the most dangerous bleedings, both in amputation and in aneurism, to the ulceration of the great artery: some of the causes I hope I have explained to your satisfaction; and the practical conclusion, which I would deduce from this doctrine, is of no small importance: it has relation, more or less direct, to every great operation; and therefore reflect, I beseech you, on those facts and principles, and judge for yourselves. It is my opinion, that a great artery never can be safe while the ligature remains about it; for, till it comes away, the artery cannot be said to have adhered, cannot be buried in granulations, nor supported by the surrounding flesh, cannot be out of danger of ulceration! Nor can a great artery ever be safe while it remains insulated: surgeons seem to take a pleasure in seeing it lying fair along in the cavity of an aneurismal sac! but they should recollect, that if the artery lies more within their reach of operation, it is also surer to need it; for being thus stripped of its cellular substance, deprived of its nutritious vessels, the part which is included betwixt the two ligatures must gangrene; the parts under the two ligatures often, in place of adhering, will ulcerate; the ulceration, in place of stopping when the ligatures fall off, will continue; and as the artery is a firm part, entering slowly into disease, it ulcerates slowly, and bursts only on the tenth, twelfth, or fifteenth day.\*

\* Vide Appendix C.

## DISCOURSE V.

## OF ANEURISMS.

*Descriptions of Aneurisms.*

**A**NEURISM, when it arises without blow or hurt, steals on slowly. A small tumour is felt, for instance, in the ham; it is small at first, and firm, and but little affected by the pulsation of the artery. It lies deep among the flesh, and must be felt for by working in the fingers and pressing aside the adjacent parts. It is supposed to be a knot or kernel, has little pain, is neglected for many weeks, and might be mistaken, even by a surgeon, for a swelled gland. These tumours begin during sickness and convalescence, while the patient is in a state of perfect quiet, and while there is not even the slightest fever to account for this dilatation of the artery; but if doubts concerning its nature remain, we generally find them all resolved by the dissection of the body. These aneurisms are found to be true dilatations of the artery; there is no breach of the arterial coats, the cellular, the muscular, the villous coats are thickened as they approach the dilated part, and may be fairly traced over the aneurismal tumour;† it is on the tumour, indeed, that the several coats are most distinctly traced. But strong as this predisposition is, we are astonished to find these dilatations end gradually and gently in the sound artery, which has in the intermediate parts not the slightest mark of disease, the arterial system being throughout limber, soft, and natural.

But aneurism arises not only from this inscrutable predisposition, but often from an actual and manifest disease of the arterial system. We frequently find throughout the arterial system, the coats of the arteries thickened and brittle, their cellular substance loose and spongy, with spots and specks of ossification besetting the great arterial trunks.‡ We find the great arteries dilated where they give off their larger branches, and

† Vide Appendix D.

‡ Scarpa is of opinion, that spontaneous aneurisms generally proceed from what he calls a "flow, morbid, ulcerated, steatomatous, fungous, squamous degeneration of the internal coat of the artery;" for which he cites numerous authorities. S.

the arch of the aorta or beginning of the subclavian arteries in an aneurismal state, while the lower part of the aorta is small, crooked, and irregular. These are the marks of a disease which prevails towards the decline of life ; it is often observed before the fortieth year ; but it is singular, that, till the approach of that period of life, natural aneurisms are extremely rare : Aneurisms are rare in women : they are frequent in strong and hard-working men ; but in them also they rarely occur till after the thirtieth year, when their arteries begin to acquire this hard and rigid condition. The defects of old age come upon the arteries sooner than upon the rest of the system : the arteries are unequal to those exertions of which the muscular frame is still capable : one part of the system is weakened before another, which is the very essence of disease, or predisposition to disease.

Yet this predisposition is of such a nature, that it seldom degenerates into aneurism, without some direct violence ; and there are few of those enlargements of the artery which cannot be distinctly traced to some external injury, some blow, sprain, fall, or violent exertion of the limb ! There are few, indeed, that do not immediately and perceptibly follow the injury. Often, I am persuaded, the artery is not merely injured, but absolutely burst or broken across ! Aneurism of the ham is more frequent, in consequence of the artery at that part lying close under the knee joint, and bound down by the heads of the gastrocnemii muscles, whence it is endangered by every sudden motion of the joint, and affected by every strain of the limb. Aneurism is frequent also in the thigh, in consequence of the length and great size of the femoral artery, its oblique course round the thigh, its passing through the tendon of the triceps, and from the manner also in which it is braced down by the muscles. The operation of these various causes of laceration must next be explained.

An artery, such as I have just described it, rigid and diseased, an artery which tears under the surgeon's ligature, which bursts upon injection, which, in dissections, feels so palpably hard and brittle, is surely not calculated to resist violent strains, or sudden motions of the joint ; and accordingly we sometimes find an artery perceptibly lacerated by external violence and sudden bending of the joint, just as it might be broken across with the finger and thumb in dissection.

"Three years ago," says Walther, "I had the long wished-for opportunity of dissecting an aneurismal limb. An old man, about fifty years of age, of a constitution naturally hale and vigorous, was confined to his bed, crooked with rheumatism, and tortured with pains in his knees ; his left knee especially



gave him great distress. This miserable creature being wretchedly poor, instead of sending for better assistance, applied to an old woman, who, having first extended his crooked knee very violently, wrapped it up in some of her plasters. This extension of his knee was extremely painful to him, and he soon perceived a small tumour upon the popliteal artery; it pulsated very strongly, and, upon the slightest pressure, produced exquisite pain. This aneurism gradually increased to an enormous size; and it was only when the poor man became sensible of having no other chance for life, that he submitted to amputation."

"The limb was immediately carried to Walther's rooms, where, upon dissection, it was found that the popliteal artery was dilated into an aneurismal bag of a heart-like shape, of three inches broad, and four inches long, occupying the main artery from a little below where it gives off its two upper articular arteries, to within an inch of that point where it divides into the tibial and fibular arteries. The heads of the gastrocnemii, *solæi*, and plantar muscles, where they covered the sac, were extended to a remarkable degree of thickness; and the great vein and nerve, raised by the tumour, were protruded betwixt the two heads of the gastrocnemii muscles, so as to be in close contact with the skin."

In the drawing of this aneurism by Walther, which is indeed very beautiful, we see osseous concretions occupying the coats of the tibial and fibular arteries below the aneurism. We have every reason to presume, that in the ham, and in the upper parts of the femoral arteries, these specks of ossification must have been much broader and more frequent. These ossifications are the surest marks of this brittle unyielding state of a great artery. An artery must, like the ligaments and other parts, where the joint continues for any length of time thus crooked and stiff, be proportionably shortened, and in this brittle state must be unfit to bear sudden extension. In this instance, some of these brittle ossifications had given way, or hurt the adjoining parts; the remaining coats of the artery had dilated into a true aneurism; the artery certainly had been injured, though not entirely lacerated, for the drawing represents a true aneurism, a sac entire and continuous with the arterial coats.\*

In natural aneurisms we see the slow dilatation of an artery. But when, as it often happens, a man in the very time of falling, or, in the instance of a blow, or sprain, feels pain in the

\* It is much more probable that in this case the coats of the artery were ruptured, notwithstanding the appearance represented by the drawing.—S.

ham, when he observes that he has from that moment considerable pain in laying his leg across; when, on the third or fourth day he feels distinctly the pulsation, pain and lameness, which are the peculiar signs of aneurism, what reason can there be for doubting that the artery is burst? None, surely, but the slowness with which the aneurism grows. The slow manner, then, in which even the greater arteries of the body form their aneurism, must next be explained.

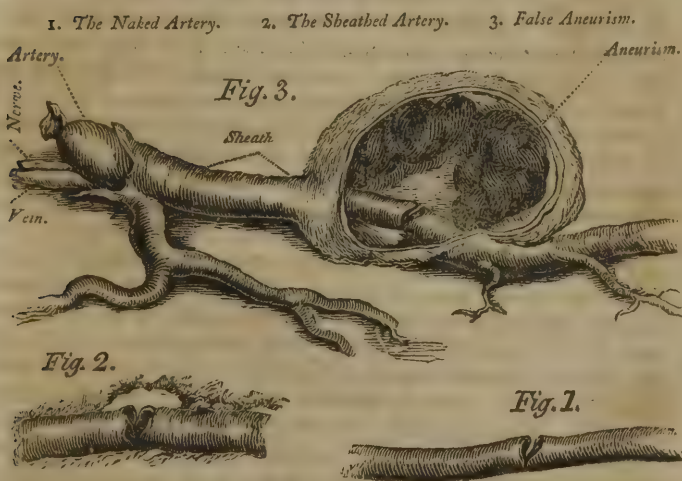
We are naturally inclined to believe, that an artery thus broken or lacerated, must form its aneurism the moment its coats give way, and must be able to overcome all resistance from the surrounding parts in a few days! But here we are deceived; we must not regard the artery as a naked and insulated tube, such as is represented in Figure 1st, merely laid along the limb, unconnected with the surrounding parts, unsupported by cellular substance. The artery has a cellular coat in which it is lodged: this coat is so peculiar as to be called the sheath or capsule of the artery, and is closely connected with the proper coats of the artery by cellular substance and numerous vessels, which strengthen, support, and nourish it; and when the proper coats of an artery are torn, the blood is not widely extravasated, but is confined by this sheath of cellular membrane, which is very slowly forced, or separated from the artery. Even after the sheath is separated from the artery, it does not entirely give way, but its cellular substance is kneaded as it were with the half coagulated blood, and rises into a tumour somewhat resembling the thrombus which rises over an ill closed vein.

Fig. 2d represents the true and natural condition of the artery which is every where nourished by its cellular sheath, and represents a laceration or rupture of the artery, showing how the sheath and cellular substance are opposed to the exit of the blood.

Fig. 3d represents the aneurism already beginning to form. Here is once more represented, the continued sheath, within which the great artery is enclosed; large branches, such as the profunda femoris, and smaller muscular twigs, are seen going off from the great trunk, each having its own peculiar sheath. For the smallest arteries are as well supported with cellular substance, and have sheaths as peculiar as the femoral or carotid arteries; each little artery, as it penetrates among the muscles, is enclosed along with its corresponding vein, and often with a small twig of a nerve, in a peculiar fascia. Aneurism produced by the bursting or laceration of an artery dilates slowly, because, the continued canal of the artery is still open to the blood, the cellular substance yields very slowly, the blood coagulating in hard and firm clots, walls up the

artery, and is so mixed with the first lamellæ of the cellular substance, and is so firmly clotted as to make a strong resistance. At first, while the blood is confined to its natural course, the progress of aneurism is slow. But when the cavity of the aneurism is enlarged, when the blood begins to collect there, and the circulation becomes irregular, these clots give way from time to time, and by exercise, working, or accidental excitements, there is from time to time a new impetus against the sides of the sac itself, and it enlarges; the clots which line the cellular substance become bigger and firmer; layer is added to layer, and at every addition of this kind, the fluid contents of the aneurism accumulate, the open part of the bag enlarges, and the cellular sheath of the artery, which in fact corresponds with the sheath in Fig. 2d, is condensed into a firm aneurismal sac, which gives the whole tumour sometimes the appearance of a spontaneous and natural dilatation of the artery itself. Thus there is formed a great tumour of clotted blood, surrounded with a firm cellular sac, and bounding a cavity which is continuous with the artery, where the circulation of the blood is irregular, and often accompanied with a whizzing noise.

*Sketch explaining the Fascia of an Artery.*



This hard and firm tumour, rising higher and higher over the artery, begins at last to compress the canal of the artery itself; the clots sometimes loosen, fall down, and almost choke the current of the blood; the limb grows cold and benumbed, from



the compression of the great trunk, and it swells and inflames from the enlargement of the inosculating arteries. By the perpetual and increasing pulsation, the pressure and straitness increase, the bones are spoiled within, and the integuments are almost destroyed without; the limb is safe, for the inosculating arteries are enlarged, yet, when the tumour bursts, the patient dies from the bursting of the main artery, and the immediate loss of blood.

Thus we perceive that the increase of such an aneurism, where the artery is absolutely broken across, is naturally slow; that the resistance is uniformly great; that the artery does not lie as in our preparation glasses, or on the dissecting table, insulated and unconnected, but is surrounded with cellular substance; its rupture is walled up with coagulated blood; its canal is open to the circulating fluids, and there is, for a long while, a firm pulse even in the artery which is desperately wounded, provided it be not entirely cut across\*.

But where the femoral artery is not merely wounded, but entirely cut, or broken across, it will no doubt form its aneurism more rapidly, perhaps in three weeks, instead of three months, as happened in a case which occurred to my friend, Mr. Harkness. The patient was master of a small trading

\* *Explanation of the Etched Plate.*

Aneurism proceeding thus, from violence done to the artery, is very easily distinguished from that which proceeds from a natural dilatation of the tube. I have given this sheet of Etchings to explain this piece of Pathology.

In Figure 1st is seen a Femoral Artery where the dilatations are plainly of that kind which is called Natural Aneurism†, the dilatation being spontaneous and gradual; and in this sketch it will be noticed, that since the profunda (a) comes off from one of the aneurismal sacs, had that sac increased so as to become a formidable aneurism, had the operation been performed, and the ligature been tied above that aneurism, the inosculating arteries communicating with the profunda would have poured their blood into the sac, and caused a secondary hæmorrhagy if the sac was cut open, or set it a pulsating again, if it was left untouched.

In Figure 2d you have a sketch of that Aneurism which I have been just describing, where the old woman, by her violent bending of the knee, injured the artery, and, I have very little doubt, broke it across, and left the breach in the artery sustained only by its external coat of common cellular substance.

In Figure 3d you have another sketch of an Aneurism, which was operated upon by Mr. Hunter. The man died some years after, the artery was dissected out, and the following circumstances deserve particular notice: 1st, The artery (b b) was ossified throughout the whole length of the thigh; this does not seem to have been the consequence of the operation merely, for the profunda, which was not touched by the ligature, was also ossified: therefore this man's system of arteries was predisposed to this rupture of the arterial coats, and his trade, viz. that of a hackney-coachman, exposed him to blows, twists, and strains. 2dly, The aneurismal sac (c) lay altogether upon the back of the artery; it was formed all on one side, as if the artery had given way on one side; it lay so over the artery, as to press strongly upon it. "The aneurism had, in some measure, the appearance of a separate bag, it was oblong, a little flattened, and like a hen's egg, and contained a solid coagulum." 3dly, It is indeed very interesting to observe the inosculations,

† Vide Appendix E.



# Drawings of Natural Aneurisms

Page. 60.

Fig 1

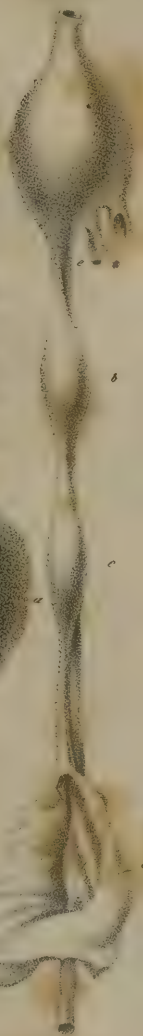


Fig 1

A diseased state of the Femoral Artery, where a b c represent a succession of Aneurismal Sacs, d one of those Sacs opened, and e the Profunda and its branches going off from the uppermost Aneurismal Sac.

Fig 2

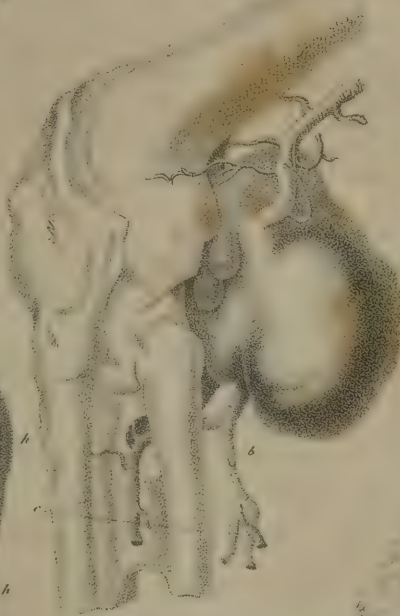


Fig 2

An Aneurism of the ham from Walther a represents the Aneurismal Sac, b small Ossifications just below the dilated part, c the Tibial Artery

Fig 3.



Fig. 3.

A Popliteal Aneurism which had been operated on by Mr Hunter, where the ossification which had predisposed the Artery to dilation is seen at b The small inosculating Arteries receiving Blood from above are marked c, and one large inosculating branch transmitting the Blood to the Artery below is marked g



vessel, belonging to Borrowstounness; a very stout athletic man, about forty years of age. Six months before, he had broken his thigh bone; the fracture was healed, but had been set so clumsily, that the lower end of the broken bone projected upwards like a trochanter. The whole weight of the body rested very obliquely upon the thigh, which was manifestly in danger from future accidents; yet, while the bones continued united, the leg was strong and serviceable.

One day, in loading some goods into his vessel, he slipped his foot and fell. Though this limb never actually touched the ground, the callus had snapped across, the bones passed one another, and the femoral artery, partly by the angle which it made over the prominent end of the broken bone, and partly by the sharpness of the bone itself, was torn almost entirely across. Even this aneurism did not increase very suddenly, and never acquired a very great size: it formed for itself a regular sac, and, moreover, when near bursting, lost its round and circumscribed form, and became flat. It is easy to imagine that an artery in these circumstances could not be well supported by its cellular substance; for the bones had been but lately reunited by a callus; they were now broken again, and all the surrounding cellular substance destroyed: there was already, as it were, a cavity prepared for receiving the blood of the artery; accordingly, the moment the man's foot slipped under him, he felt extreme pain from the various parts which were lacerated, and even that night the tumour began to form. The next day the tumour was large, and pulsated very strongly; and in a few days its pulsation was so powerful as to raise the bedclothes. But from the time in which the artery began to be resisted by the thick muscles and fascia of the thigh (for the aneurism lay altogether under the belly of the vastus internus) it hardly increased in size: it remained quite stationary for a fortnight or more: even the pulsation, which had begun to

for we find every mark of great activity among the smaller arteries of the thigh, to supply the want of the trunk. The femoral artery is indeed obliterated in the thigh at (b b), but for some space above the aneurism, as at (d), the canal is again open, and receives many inosculating arteries (e e e), and is full of blood. The popliteal artery, under the aneurismal bag, is so obliterated that the lower mouth of the artery cannot be found. At (ff) the popliteal artery becomes once more pervious, it there also receives many inosculations; by those inosculations the blood probably came down both from the profunda, along the back of the thigh, and also by shorter inosculations, joining the pervious part of the artery above the aneurism, to the continuation of the artery below the tumour; e e e marks the inosculating arteries, d marks the pervious part of the artery below the tumour, and f the division of the popliteal artery into the tibial and fibular arteries; g marks a large and curling inosculating artery, which manifestly has borne much of the force of the circulation, is greatly enlarged, and seems to have taken precedence of all the other inosculations; h h h marks the great crural vein, with its branches accompanying the artery.

be very powerful, was in some degree deadened by the accumulation of blood, and the pressure of the surrounding parts, and somewhat reduced by the enlargement of the collateral arteries. The limb preserved its natural heat and circulation: every thing was favourable to the bold attempt of saving a limb at once fractured in its bones, deprived of its main artery, and loaded with a great aneurism. This operation was once agreed to, but a second consultation condemned the limb to be cut off: it was cut off, and the man died.

Thus we perceive, that even the great femoral artery, although entirely torn across, forms its aneurism but slowly. The amputation of the limb, in this case, was performed the fourth week after the fracture of the bone and bursting of the artery, and yet the aneurism had attained but to a moderate size: and the following case shews that even when the aorta itself bursts, it forms its aneurism very slowly, and does not, by any means, prove immediately fatal.\*

An officer of distinction, about forty years of age, was wounded in the battle of Fontenoy; and from his long confinement to bed he fell into bad health. He was distressed, during his confinement, with nephritic complaints, and, soon after his recovery, was seized with vomiting and spitting of blood. He went to Bristol Wells, recovered his health, and continued for nearly ten years to live a careful and regular life, attentive to his exercise on horseback, to his diet, and to the quantity of wine he drank.

About ten years after these complaints he seems to have been suddenly seized with very inexplicable distress, which soon ended in his death. He began first to complain of want of rest, tenesmus, gripes, and mucous stools streaked with blood. These symptoms were appeased by some draughts of oil, manna, and rhubarb, but the watchfulness continued. The patient felt more than usual pain in his belly, especially in the left side; he feared a return of his gravelly complaints, and about a month after this first attack, he consulted Sir John

\* Except in those cases in which a rupture takes place in that part of the aorta included in the duplicature of the pericardium, in which event death immediately ensues. Vide Wislart's Scarpa, p. 81, for an instance, and citations of others.—S.

Another case, which is an exception to this rule, is stated by Mr. B. from Warner, who relates it, apparently from memory, in few words, but very decisively; the general impression of the case upon his mind seems to have been very strong. "Some years ago the operation for aneurism was performed in a similar case within a few hours of the rupture of the vessel, the tumour increasing so fast, and the pain proving so intolerable, that it was necessary to lose no time. The tibialis postica was burst in the middle of the leg: it was taken up with some difficulty, and the patient recovered."

An immediate operation is the only means of saving the limb, and probably the life of the patient, under such circumstances.—S.



Pringle. A hiccup had come on, the pain was now constant, sharp, darting to his back, groins, and testicles; it was especially severe when he turned to his right side, but he never attempted to turn upon his left. These were the decisive marks of some organic disease. The disorder was quite unaccountable. His pulse was quicker, harder, and fuller than natural. He had some degree of thirst, but his head was clear. Such was the degree of watchfulness, that for six weeks he had not been sensible of slumbering half an hour: for the last three weeks of his life he was hardly sensible of having even closed his eyes. His feet, he observed, were sometimes benumbed, which made him call for more wine than usual; and though he had no sickness at his stomach, his appetite was gone. He was bled, but as he grew daily weaker, they were afraid to repeat the bleeding; and for his hiccup, he took musk and absorbents, without effect. Opiates were not omitted; and both on account of the hiccup, and in order to procure sleep, laudanum was given; at first in smaller doses, but his physicians were soon obliged to give it to the amount of one hundred drops during the night, without checking the hiccup, or obtaining sleep; but it raised a general perspiration. He seemed, after this, to be relieved: his spirits revived, the pain ceased; but this was the deceitful prelude to death. On the day of his death, he continued all the morning wide awake, sensible and in good spirits, but with an incessant hiccup. About four in the afternoon he called for drink; but before the servant could warm it, he suddenly expired.

The dissection of this gentleman's body proves to us a very unprecedented fact, that the aorta itself sometimes gives way; that the aneurism, which its laceration forms, is hardly more rapid in its growth than that of a smaller artery;\* that the sac which it forms out of the loose cellular substance, is firmly attached to the artery, as if the aneurism had arisen from mere dilatation. The abdominal viscera were sound; but there was a tumour larger than the fist, of an oblong figure, lying close to the spine, by the side of the aorta descendens, and in the direction of that vessel. It began as high as the emulgent arteries, descended nearly to the pelvis, and was of a very firm consistence. It was found to consist of coagulated blood, condensed in the cellular substance, and under the adjacent parts of the periosteum were some detached parcels of extravasation. This

\* The rapidity with which an aneurismal tumour enlarges, depends rather upon the extent of the breach in the arterial coats, and the situation of the artery with regard to the surrounding parts. Thus a popliteal aneurism must necessarily increase slowly from its confined situation; whereas an aneurism of the external iliac artery would increase with much greater rapidity, from the opposite cause.—S.

abdominal portion of the aorta, along with its tumour, were dissected out of the body, together with a part of the thoracic aorta, and of the common iliac arteries, and the middle part of the aorta being laid open through its whole length, there was observed, in the space between the emulgents and lower mesenteric arteries, a complete rupture of all its coats. The aperture had lacerated edges; was big enough to admit the point of the dissector's thumb, and led into a tumour, which now appeared to be a SPURIOUS ANEURISM of the GREAT ARTERY; that is, a sac formed of the cellular membrane, containing blood of different degrees of coagulation, which apparently had issued at different times from the aorta.

The neatness of this dissection prevents all those doubts which puzzle us in cases less correctly related; but the case is written by Sir John Pringle; the dissection was performed by Hunter; the tumour was not first mangled, more canino, and then the connections and causes of it stated in idle conjectures. The aorta was slit up on that side which was sound. The dissectors saw clearly the connection of the tumour with the artery. The artery was burst, the laceration had ragged edges, preventing all suspicion of previous dilatation; the breach was such as to admit of the dissector's thumb, and was proportioned to the size of the artery. The sac was formed in the cellular substance, condensed in proportion to the driving of the blood, and it adhered so to the artery as to be cut out along with it, and certainly would have been reported by less dexterous dissectors, as a natural aneurism which had burst. The blood was collected by several successive extravasations; the artery making (according to the exertions of the body) successive impulses against the cellular substance, and against the peritoneum, which serves as the sheath for this vessel. For our entire satisfaction in regard to the nature of this disease, we, in another paragraph, learn also the cause, for "the aorta was not dilated above the aperture, but its coats were at that place harder than natural, as if tending to ossify, and having lost their natural elasticity and toughness, were parted asunder."\*

Here then is the greatest artery of the body burst; fairly torn asunder, and that without any strain or blow.† The

\* "Upon the review of the whole, we conclude that a small aperture had at first been made at this weak part of the aorta. Some considerable time before the death of the patient; that the tumour had been gradually formed of the oozing of the blood into the cellular membrane surrounding the artery, and which thereupon was dilated into that sac mentioned above." Vid. Sir John Pringle's *Medical Essays and Observations of Edinburgh*, Vol. III.

† Mr. Ellis observes, That "the arteries sometimes become ruptured without any previous dilation. I have (says this author) a preparation of the aorta ascen-

greatest artery of the body, not supported like the femoral artery by a peculiar sheath, nor bedded in firm cellular substance of muscles, but merely covered by the peritoneum, and lodged in the loose cellular substance of the kidney, is yet so supported as to form its aneurism very slowly. The blood is forced into the cellular substance by successive impulses. The sac is fairly circumscribed, and forms an oblong tumour not much bigger than the fist, though of considerable length, lying close to the side of the artery, and so connected with it as to be cut out along with it: well may such a sac be mistaken for that of a natural aneurism in bungling dissections.

Thus have I proved to you, that an artery is sometimes dilated gradually, sometimes is hurt in its coats, but very often is burst, lacerated, or entirely broken across\*. That after being burst, it is supported by its sheath. That the cellular substance receives the blood; while the breach in the artery thus walled up with coagula, forms its aneurism slowly; that the greatest arteries of the body form their aneurisms slowly, and have the cellular substance and arterial sheath beaten into the form of a distinct sac; and that an aneurism which truly arises from a laceration of the artery may be mistaken for a natural aneurism or simple dilatation of the tube!

## SECTION II.

### *Conclusion.—Containing a description of various anomalous cases of Aneurism.*

To what practical uses these speculations may be applied, you will next inquire; for, unless they have some influence on practice, your interest in them should be but very small. You will remark that no sooner is it proved to you that an artery may be burst by a strain of the limb, than you begin to look upon certain accidents which are apparently trivial, in a new and serious light. In the case of a direct wound of an artery,

dens, appearing in no place dilated, which exhibits two ruptures, one is small, and situated about half an inch distance from the valves, from which a coagulum was formed about the size of a large nutmeg, that was seated between the trunk of the aorta and the trunk of the pulmonary artery. From the white appearance of the coagulum, and the regularity of the edges of the rupture, it seemed to be of long standing. The other rupture is much larger, seated at the curvature between the exit of the right and left carotid arteries, the edges of which are torn and irregular, and formed a tumour, which pressing against the lower part of the trachea, and the branches of the bronchia, destroyed the patient by suffocation in less than a month from its first rise, and before there was any appearance of an external swelling.

\* This last is probably a very rare occurrence. S.

succeeded by a large tumour, with strong pulsation, and all the characteristic signs of pure aneurism, you can be at no loss to distinguish the nature of the disease. But too often it happens, that when this disease begins in a sprain, when the pain is great, the pulsation small, and the whole member swelled to a great size, the general swelling conceals the particular swelling of the aneurism, and the limb is destroyed before the surgeon is aware of the nature of the disease. These are the cases which are so generally called anomalous, or, in other words, cases which are not understood. While the surgeon, unwilling to believe that an artery is burst by a sprain of the limb, remains ignorant of the nature of the disease, the artery is actually ruptured, and is pouring out its blood among the muscles; the bones are presently destroyed, the whole limb is ruined in its texture, swelled, cold, and lifeless. The surgeon cuts it off, and being as little expert in anatomy as judicious in surgery, he, upon finding bones, blood, and matter mixed in one confused mass, learns by his dissection nothing more than he did by his previous inquiries; he calls it an anomalous case! but these are not the less aneurisms, because of our being ignorant of their nature and origin, and of that process by which they come to this last stage of irregular suppuration.

This is the general termination of neglected aneurisms; but there are certain occasions in which the disease infallibly assumes this form. First, Wherever the aneurism is produced by a broken bone, for there the artery is wounded or broken on the side next the bone, the blood is poured out under the bellies of all the muscles, the resistance to its outward extension is great, and the inward destruction of parts is proportionably rapid. Secondly, When the aneurism happens in the ham, or under the bellies of the gastrocnæmii muscles, for there the aneurism is peculiarly straitened, it is pent up betwixt the hamstring tendons, it forms slowly, is singularly hard, and frequently has neither the pulsation nor other marks of aneurism; but the knee joint being destroyed, the bones corrupted, and the limb enormously swelled, it requires amputation long before the tumour threatens to burst! even amputation is not safe! Thirdly, But most of all, the limb is in danger when the case is not understood; when the artery is not wounded, nor gradually dilated, but actually burst; for the surgeon, little accustomed to think of this bursting of an artery, never apprehends the true nature of the complaint, nor even knows it to be aneurism! After having amputated the limb, his exculpation consists in calling it an anomalous case, intimating that it was unintelligible and incurable.



*Of Aneurism from Fracture of the Bones.*

Aneurism, from fracture of the bones, is more or less important according to the artery that is wounded, and the other circumstances of the case. In a fracture near the ankle, the artery is small, the aneurism superficial, the resistance outwardly is slight, whence the bones within are proportionably less endangered. In such aneurism behind the ankle, in the Fibular Artery, for example, the tumour should be opened, the artery tied, and then the bones reunite, but till you have tied up the artery, you have in general no reunion of the bones. We find that this aneurism also grows very slowly, insomuch that sometimes it hardly appears till after the callus is formed, and the patient begins to walk. There are indeed exceptions to the general rule, for the fracture sometimes heals while the aneurism goes on. "A surgeon of Guand, being called to set a broken leg, applied the usual bandages, and in the usual time accomplished the cure. But when the young man began to walk abroad, a tumour was observed behind the ankle, over the place where the bones had been broken: the surgeon (now called again) being ignorant of the nature of the disease, applied a caustic, but when he opened the eschar, instead of matter which he expected, blood gushed out so impetuously, that it was stopped with great difficulty. The young man fainted in the moment of this hæmorrhagy, and expired in two days after\*."

When the artery is of another order, larger and lying deep among the muscular flesh close upon the bone by which it has been lacerated, the case is more unfortunate, and if neglected, too frequently terminates in mortification and death. The tumour caused by such an artery is large and diffused, the coagula of blood which oppress the limb are very large, and consequently the pulsation is not distinct and smart, but heavy and throbbing. Knowing, as you do, the principles of Surgery, you need not be informed, that if the oppression be allowed to increase, the limb will fall into gangrene, or the skin burst and the patient bleed to death. And you must be sensible, that if the skin be left to burst, you must then search for the artery and tie it, with but a poor chance of success, the extravasation having quite ruined the texture of the limb. If again the oppres-

\* Palfin, page 341. This is a rare exception to the general rule, that such complicated fracture cannot heal till after the artery is tied. In this case, probably, the artery had formed a small sac for itself, distinct from the lacerated cavity formed by the fractured bones.

sion be allowed to increase till the limb become generally swelled, cold, lifeless, and in danger of gangrene, you must cut it off, without perhaps the consolation of saving even the patient's life, for such a limb is apt to run into gangrene.

When an artery, then, is thus lacerated, along with fracture of the bones, you have but this alternative to cut the limb off at once, if it be very desperately wounded, or to try to save it by making incisions (as in simple aneurism), and tying the artery! If you call a consultation, it is not to decide so clear a point, but to satisfy the friends and exonerate yourself. The fracture is already complicated with aneurism, and you are under the dangerous necessity of converting this complicated aneurism into a compound fracture! You apply your tourniquet, make a long and deep incision, turn out the coagula of blood with your fingers, cleanse the sac with sponges, search for the artery and tie it up†. You wash out the blood from the sac with syringes and sponges, for while it lies betwixt the bones they cannot unite; what blood you are forced to leave melts down into bad matter and flows off; the deeper parts of the wound gradually digest, granulate, and fill up with soft flesh; and when the continuity of the parts is thus restored, the new bone or callus begins to form. Such is the activity of a wounded artery in forming its aneurism and destroying the surrounding parts, and so complicated is the disorder when a wounded artery is added to a fractured bone, that unless these operations are performed early, the limb is inevitably lost.

But the condition of the periosteum must chiefly be regarded, for being part of the system of the broken bone, it is capable of generating new bone, and the form of that bone will be regulated by the parts upon which it may be moulded. The periosteum being now expanded into the form of a cyst over the broken bone and aneurismal blood, its new secretion of bone will spread over the aneurism. The outside of the periosteum is still connected with the muscles and other soft parts, it is nourished and receives its vessels from without, and lives, and thickens, and begins a secretion of bone. The secretion while it is in this unnatural extended condition is very powerful, and the bone which is formed by this dilated or expanded periosteum, is not only firm, but broad like a scull. We often see the lacerated periosteum and the membranes of fractured and luxated joints, or of carious bones, forming great bony caries or stalactitic-like projections. In gun-shot wounds, with fractures of the upper part of the thigh bone, in the scrophulous caries of

† For more particular directions for taking up wounded arteries, vide chapter on that subject. S.

the hip-joint, in luxations of the thigh-bone from the acetabulum, in fractures of the cervix femoris, in compound fractures and luxations of the wrist, and in fractures of the shoulder-bone, bony cavities are often formed as big as the head of a new-born child. In cases of aneurism, it is more difficult for the periosteum to live, or to form those bony cavities, but when such cavities are formed, they are filled with blood like coffee-grounds, and constitute a most irregular, or as it has been termed, anomalous disease; and round the outside of such bony cavities go the enlarged branches of the artery, which preserve the limb notwithstanding all this disorder. It is in such cases that we are almost at a loss to say, whether aneurism or exostosis has most share in forming this fatal tumour.

I shall illustrate this species of mixed aneurism, by relating a case which was communicated to me two years ago by my friend Dr. Jeffry, professor of anatomy in Glasgow, whose abilities and zeal are universally known. Dr. Jeffry had the goodness to send me along with the preparation, the following short narrative of the case:

“An old woman of about fifty years of age, was rode down in the streets by a cart, and her arm broken in two places. One of those fractures was about two inches above the elbow, the other was above the middle of the arm, and the whole bone was greatly shattered; yet this poor creature had no assistance, no surgeon was called, the arm remained unattended to for six weeks, when Mr. Parlane, a surgeon in Glasgow, visited her and found the arm greatly swelled, so that he could neither distinctly understand the nature of the injury nor the condition of the bone; it was presumed that there was a fracture, and the patient was laid in a posture favourable to the reunion of the bone.”

“The tumour never subsided but increased, occupied the whole arm from the elbow to the top of the shoulder; pulsation was distinctly felt at the top of the shoulder, but of such a kind as might proceed from some artery near the surface, it was judged to be really so, the idea of an aneurism certainly had never struck the gentleman who attended her, for he opened the tumour which was soft and fluctuating, there was no doubt of its containing a fluid of some kind or other; the lancet was struck into it, but instead of matter, as was expected, blood flowed in a full stream.”

“This puncture healed up easily, the tumour which had subsided when it was thus imprudently opened, soon filled up again to its full size, and the hand and fore arm became œdematous and cold. In this condition the patient survived five months, the tumour pulsating manifestly, especially in its upper

part; but how this woman died, or after what kind of sufferings, is not related in the case."

"On opening the body after death, eight months and more having elapsed from the time of the fracture, a profusion of mixed and putrid blood like coffee-grounds was discharged. Two inches of the lower part of the bone retained its natural form, all the middle part of the bone was destroyed, the head only remained on the upper part of the tumour, but with its cancelli quite eroded, nothing being left but the mere shell. Through the whole length of the bone, the cancelli were completely dissolved, and the outer bony lamina were found adhering to the whole inner surface of the sac, many pieces of the bone were found in the heart of the tumour, and on the fore part and middle of the tumour was found one piece of bone two inches and a half long and nearly two broad."

"Although the humeral artery was injected, it could not be perceived from what branch of it the tumour was produced."

We need but to review in the history of this case a few circumstances, in order to understand the whole disease in the most unequivocal manner. First, The sudden rising of the tumour, the swelling of the whole arm, the fluctuation, the pulsation in the upper part of the tumour, prove, that though the chief part of the tumour is found upon dissection to be bony, yet aneurism, and not exostosis, formed the basis of the disease. Secondly, The striking of the lancet into the tumour shows that there was blood very early; the sudden filling up of the tumour to its full size, after having been punctured with the lancet, shows that the artery was open at that time, and throwing its blood freely into the sac; and finally, the bony cavity being filled at the time of death with nothing but corrupted blood, which always after long delay assumes the appearance of coffee-grounds, proves the tumour to be merely an aneurism; but it is a complicated aneurism; it is combined with a fractured bone; and the condition of the periosteum accounts for the generation of such extensive plates of bone, equal to a cranium in size, and something like it in the breadth and flatness of the ossifications. Thirdly, It being proved that the disease was aneurism, it is next to be observed, that there is not belonging to the humeral artery, as to the femoral, a great profunda, or collateral branch, as large as the trunk itself; there are but two muscular branches in the arm, and those not larger than crow quills; there is no artery, except the trunk itself, equal to the production of such an aneurism. The branches which run on the inner surface of this tumour, were all singularly well injected, which shows that none of these had any share in producing the aneurism; and surely none of them had terminated



in the bag ; even the force of the injection had not burst their most delicate branches ; they were full of the injection, and the bag empty. While the entireness† of these branches proves that they had no share in forming the aneurism, the enlargement of the profunda inferior, to such a size as to rival the trunk itself in diameter, is another proof that the trunk was wounded ; for nothing but the wound of the trunk could thus enlarge the profunda.

This is one of those cases in which, as I have expressed myself, one is almost at a loss to decide, whether aneurism or exostosis has the greater share in forming the disease. The confusion of the case is almost an apology for any mistake of the surgeon ; yet the suddenness of the tumour, the pulsation, the blood following the lancet, were signs too conclusive to allow of any doubt. There must have been in a certain stage of this case such œdema, oppression, coldness of the limb, and suppression of the pulse, as might have intimated to the surgeon that the change in the state of the circulation had taken place, on which the fate of such a limb depends. The patient living with an aneurism certainly proceeding from the rupture of the great artery ; living also under such a complicated and oppressive disorder, fracture, exostosis, and extravasated blood, proves to us that there is hardly any case in which we need despair ; and the enlargement of all the arteries in this limb, is authority for performing the operation for aneurism, even when the main artery is ruptured, along with a fracture of the bone.

### SECTION III.

#### *Peculiarities of popliteal Aneurism.*

In all cases of neglected aneurism, this destruction of the soft parts, and caries of the bones, is the last stage of the disease. But in popliteal aneurism, whether proceeding from spontaneous dilatation of the artery, or arising from strains, fractures or wounds, the danger is peculiar ; for the aneurism is so confined under the heads of the gastrocnæmii muscles, and betwixt the tendons of the hamstrings, that the resistance to its extension is very great, the destruction within is proportionably rapid, and the disease is always attended with severe pain.

The popliteal artery passes between the condyles of the thigh-bone, and behind the knee joint, by every motion of which it

† Does not the entireness of the trunk as fully prove that the aneurism was not caused by a wound of it ?—S.

is affected. It also lies under the gastrocnæmii muscles, whence it is endangered by every strain of a limb which is very powerful, and which supports the whole weight of the body. A man, for example, has a fall from his horse, and hurts his ham, or strains it in mounting his horse; or his limb falls in betwixt the rounds of a ladder, and is violently and suddenly bent; or he receives a blow upon the ham, or he is seized with a sudden cramp in the calf of his leg, and from that moment his pains and lameness begin. Whether the artery be merely stretched and inflamed, or whether it absolutely gives way under such accidents, is little to the present purpose; but thus it is that the disease begins, and is long unsuspected by the surgeon, while the patient walks, or refrains from walking, by fits, as the pain happens to be more or less violent, rubbing the part perhaps with camphorated oil.

Thus all parties continue indifferent to one of the most fatal diseases. The ham is straitened, whence the tumour, even from the first, is of a stony hardness. From this straitness it loses very early the marks of aneurism, for the pulsation often ceases, or is very obscure. The tumour (even in natural aneurisms of the ham) is not always clearly circumscribed, nor to be fairly traced to any connection with the artery; and being covered, and its pulse suppressed by the great thickness of the muscles and skin, the nature of the disease remains unknown. From the same pressure the leg becomes very early cold and œdematous; for the veins, lymphatics and artery, all pass in this straitened cavity of the ham, the pressure upon these produces a general swelling of the limb, which conceals the particular tumour. From the elevation of the bellies of the gastrocnæmii muscles over the tumour, and from the distention of the hamstring muscles, the limb is thrown into severe and painful cramps; and from the nerve passing over the tumour, (pressed sometimes quite flat) a very distressing numbness is always felt, and the lameness and pain are such as the external swelling cannot account for. All these distresses of pain, cramps, swelling, and general numbness of the limb, increasing every day, the patient sometimes dies of locked-jaw, fever, or long suffering and want of rest, the disease becoming fatal before that period arrives in which the tumour bursts.

Although it is very certain that aneurism is often unattended with pulsation, yet it is not unlikely that sometimes those collections of blood which fill the ham, and hurt the joint, and end in caries of the bones, proceed from ruptures of the veins; for the veins, more delicate than the arteries, are exposed to the same violences as the artery, since they accompany it; and varices of the internal veins are capable of producing similar

effects with proper aneurisms. The destruction of the bones arises not from the pulsation of aneurism, nor from any thing peculiar in the nature of the arterial blood, but merely from the injection of the cellular substance with the blood, together with the general pressure, and the internal ulceration, from the presence of a foreign body. Perhaps the sudden rising of a tumour from a strain of the limb, a sense of laceration in the part, the slow increase of the tumour, and the total absence of pulsation through all its stages, may be esteemed among the signs of a ruptured vein.†

#### SECTION IV.

#### *Of the Progress of Aneurisms, and their Cure.*

IN the natural progress of every aneurism, there is a certain critical point to which, when it arrives, the struggle betwixt the pulsation and the resistance must end. If the pulsation is to prevail, the parts become thin, the tumour bursts, and the patient expires. If, on the other hand, the resistance be such as to oppress the artery, then the pulsation does not all at once cease, but the collateral arteries enlarge, and begin to carry off the blood from the aneurism at the very moment it threatens to burst. By this change of circulation, the pulsation of the artery is weakened, so that the swelling, weight, and resistance of the surrounding parts, and of the coagula formed within the aneurism, are able to resist the stroke of the artery; its pulsation flags, and the collateral arteries enlarge; its pulsation at last ceases, and there is to be observed, betwixt the loss of one circulation and the establishment of another, an interval of coldness and deadness in the limb. The circulation is thus, for some time, upon the turn; and when this critical period arrives, the limb is prepared for the happiest changes; and no sooner is the circulation in the great artery stopped, than that of the collateral arteries is substituted in its place.

This enlargement of all the smaller arteries implies a condi-

† In one case the disorder was fairly traced to the veins. Mr. Elfe, in his works relates a case of this kind, in which the limb was amputated on account of the caries of the bone. Upon throwing a wax injection into the arteries, it was not extravasated in the tumour, but ran freely along the arteries to the foot. Upon examining the great vein, a rupture was found immediately above one of the valves.

Any tumour, lying in contact with an artery, will receive a pulsatory motion from it; therefore, a tumour from a ruptured vein might pulsate. If the tumour be sufficiently soft, to enable you to press out all, or even a very large proportion of its contents, it is evident that, if it arises from a ruptured vein, it will not fill with the same rapidity as from a divided artery.—S.



tion of an aneurismal limb, which, though hitherto unnoticed, is too full of important conclusions to be omitted ; and the condition of the aneurismal limb is still the same, whether we perform the cure by tying the artery, or attempt it by compression, or whether we neglect the aneurism till it obstructs the artery, and obliterates it by its pressure, or bursts inwardly among the cellular substance.

When the celebrated Guattani succeeded in curing aneurism by long confinement, with compression and firm bandaging, he believed that he had repressed the aneurism, and actually saved the channel of the blood, by preserving for it a free course through the main artery of the limb. Were this opinion correct, the tumour should yield at first, then become flaccid, then its blood should be altogether discharged into the artery, and the artery should be apt, on removing the bandage, to inject the empty bag and fill it again : in short, the sac of the aneurism should be repressed as a prelude to the cure of the disease. Again, suppose (by some process of the economy, which I cannot foresee, and which surely never did happen) that this were really the succession of the phenomena in this cure, the artery, after such a cure, should carry its blood freely, the pulse should be as strong as ever, and whatever remained of the tumour, though it were but a thickening of the parts, should receive the stroke of the artery, and this residuum or remains of the tumour continuing to pulsate thus, the operator never could be assured of his cure, and would never lay aside his compress.

But in truth, the last stage of the process is this : The artery being for some time opposed by the gradually increasing tension of the parts, the blood is thrown upon the collateral branches ; the blood passing along the collateral branches, allows the compression to be increased without that intolerable sense of numbness and pain, which the compressions of the first week cause. At last the compression is supported boldly, firmly, unremittingly. If the operator stop short of this, the disease returns ; but if he entirely compress the artery, the blood forsakes it, the pulsation stops, the tumour remains solid and firm, and does not enlarge, because the blood no longer flows into it, nor does it even beat again, because the artery which lies under it is obliterated by the pressure. Thus, we perceive, that Guattani, when he cured by compression, had no reason to continue his bandages for years, nor to fear a return of the disease. He performed, in fact, a radical operation ; he obliterated the artery as fairly as if he had tied it with the four tapes, which have been so often used in this piece of surgery.

A grave-digger had an aneurism, which was large, attended with pain, fever, a throbbing pulse, and great swelling of the



limb, but not particularly hard ; you rather seemed to feel in it a sort of fluctuation. But the case was well marked ; for “ in the last week of July he had hurt his limb in a very violent effort ; it was while he strained very hard in lifting the confession-desk from one part of the church to another, that he felt something give way in his ham, with a sudden pain, but yet bearable, so that he was able for some time to continue his labours. He was ignorant of the nature of his disease, and had used only the more harmless applications, till the time of his being laid in the Hospital of St. Peter, under Guattani’s care.

“ This man was brought to the hospital in the first week of August. For the first eight days he was bled, dieted, confined to bed, and reduced so that the stricture of the bandage might be safe and tolerable. Then the compression was begun, carried on step by step, and occasionally renewed ; but on the first week of November, Guattani found that the pulsation of the tumour had entirely vanished, and the tumour remained moveable.” “ Yet I failed not (says he) to renew the compression, and with such happy success, that by the middle of January my patient left the hospital perfectly cured, excepting a halt in his gate, and that not remarkable.” “ Two months after, I sent for him to examine the parts, when I found in the ham nothing but a small hardness, about the size and shape of a chestnut, resembling an exostosis.”

There cannot be imagined a more correct history of an artery obliterated by compression. The patient was bled, kept upon very low diet, and confined to bed, which relaxed the parts, and the tumour was so compressed, that in the course of one month the pulsation disappeared ! The pulsation had disappeared, though the tumour remained, which shows that there was not pulsation enough in the artery even to affect the tumour. He next performed a work of supererogation, for the artery was obliterated, the pulsation gone, the rest should have been left to nature ; but he applied his compress and bandage again, and in the two succeeding months did no more than stiffen the ham.

Let us next observe, whether we have not the same marks of obliteration of the artery, even in those cases of spontaneous cure, where the surgeon thinks that the canal of the great artery is still pervious. Mr. Blagden, surgeon at Petworth, was consulted by a man of about fifty years of age, tall and muscular, who had his humeral artery wounded in opening the basilic vein. The blood flowed in great quantity ; and, per saltum, was stopped by strong compression. First, an ecchymosis extended itself generally from the shoulder to the wrist ; then the aneurismal tumour formed, and in six months it had

increased to the size of a cricket ball. The arm was oppressed, cold, shrunk, and, as the patient expressed it, painfully lifeless: he was advised to have the operation performed, but he first thought of consulting Mr. Blagden.

Mr. Blagden found the aneurism of this great size, hard, with a strong pulsation in it, but the fore-arm below was cold and pulseless. Now the patient had assured Mr. Blagden that the tumour had been larger; that it was subsiding; that the pulse in it was somewhat abated; and Mr. Blagden did not scruple to advise, that he should wait the issue of these changes, rub the arm with the flesh-brush, and refrain from exertions.

In a few weeks the arm grew a little warmer: in about three months he began to be sensible of a tremulous pulse at the wrist: the tumour gradually diminished, and the strength of the pulse at the wrist increased: in eight or ten months the tumour in the bend of the arm was reduced to the size of a hazel-nut, while the pulse at the wrist was quite restored, and the arm as full and fleshy, as capable of as powerful exertions, as the sound one; but he was desired to avoid such exertions.

The author concludes with this sentence: "It is too evident to admit of any doubt, that the circulation is carried on in its usual course through the artery, and not through the lateral anastomosing branches of it."

I am well assured, that in this case the blood passed only through the anastomosing branches; the profunda and ramus anastomoticus were enlarged, the trunk obliterated, and the circulation along the fore part of the arm gradually subsided in proportion as the vessels upon the back part enlarged.

As, however, spontaneous cures are rarely to be expected, and as there are but few cases in which compression can be used, I should, in every instance, recommend the operation first discovered, or at least introduced into practice, by Mr. Hunter.\* This operation is one of the most important improvements in modern surgery, and one which only a great surgeon could invent. In this operation you imitate the natural and spontaneous cure: the limb is prepared for that change which you mean to complete by your operation: the main artery is compressed by the aneurism: the collaterals are enlarging: nature has begun a process, with which it is dangerous to interfere, which you are to complete: you cannot, with prudence, make an incision into the diseased mass: you would not choose to cut the parts which are supplied with blood by those very inosculation which you wish to save. In Mr. Hunter's operation, you tie the artery far above the aneurism, and thus avoid a part of the artery, which is frequently dis-

\* This operation is practicable in the neck or extremities only.—S.

eased: you stop the blood, and throw the whole circulation upon the inosculating arteries: you but complete that process which nature had begun, and leave the absorption of the tumour to time.

You make this small and superficial incision (hardly three inches in length) upon the fore part of the thigh, above the part of the limb affected with aneurism, and of course you have no thickness of parts to cut through, except what arises from the general œdema of the limb. Your first incision is through the skin; your next is through the strong fascia of the thigh; you encounter no inosculating arteries; you deprive the limb of no one blood-vessel, except the great artery, which it is at any rate about to lose, and which is already much compressed; you make no disorder in the limb; you touch no diseased part; you have no deep digging for the artery; you have no difficulty, no uncertainty in tying it; you run no risk of secondary hæmorrhagy, at least from the articular arteries; you make no incisions among parts which are choked with extravasation, where the muscles themselves seem hardly more alive than the coagulated blood which they contain; you expose no joint to ulceration, nor any bones to caries. Far from increasing those disorders, which are within the injured part, you rather take away the cause of disorder, by preventing any further effusion of blood. Your incision is small; your way to the artery is direct; you feel your way by the pulse of the artery, and are assisted by your knowledge of the parts; if you be really an anatomist, you must perform this operation in a few minutes; if you be not, and dare to undertake such an operation, I know of no punishment too severe for such unprincipled conduct; no human reproaches can touch a mind which does not feel the punishment within.\*

Let us now attend to the effects of our ligature, not upon the artery which it intercepts and cuts across, but upon the tide of blood which it diverts to the other arteries of the limb. When we operate with a ligature on an artery, we can mark the very instant in which it is obstructed: we perceive, after a momentary coldness and deadness of the limb, a renewed action of its vessels and increased heat. We find the limb cold when its blood is for a moment obstructed: we find its heat rising far above the natural pitch, while, as yet, there is no pulse in the great arteries of the lower part of the limb; for at this time all the smaller arteries of the limb are enlarged and acting very powerfully. The smaller arteries perform, for a certain term, the office of transmitting blood; but when one artery takes the

\* For particular directions for performing this operation, vid. Ap. F.

lead, and acts with such power as to become the direct trunk for all the arteries of the lower part of the limb, then the general vascular action of the limb subsides; the blood is drawn into one or two channels; the vessels in general resume a natural and quiet action; and the heat, which had risen 6 or 8 degrees above the natural temperature, falls to 96.

Thus, you will observe, that the aneurismal limb, which has suffered the operation, and whose main artery has been tied, is not deprived of circulation, as has been represented, nor cold, nor apt to fall into direct gangrene; its circulation is intense: if disposed to gangrene, it must be to that gangrene which arises from excessive action.\*

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## DISCOURSE VI.

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ON WOUNDS OF THE ARTERIES; OF THE ANEURISM WHICH FORMS OVER THE WOUNDED ARTERY; WITH GENERAL INSTRUCTIONS AND RULES OF CONDUCT FOR THE OPERATIONS ON SUCH ANEURISMS.

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### SECTION I.

*Of the formation of Aneurism over a wounded Artery.*

WHEN a person is wounded in any great artery, the blood flows in so full a stream, that in a moment he faints, and it is then only that the by-standers can command the blood (by gathering up any cloths that are at hand, and cramming them into the wound in a confused and ineffectual way), till at last the

\* There are two cases on record, in which mortification took place in consequence of the collateral arteries not enlarging sufficiently to carry on the circulation. Vid. Appendix to Scarpa on Aneurism, by Wislart, p. 481.—S.



surgeon comes and stops it altogether. When called in good time to such a wound, he should clap the point of his finger upon the divided artery, or make his assistant hold it while he lays open the wound more freely, obtains a distinct view of the artery, and draws it out from among the cellular substance if it be cut across, or if it be only punctured, passes his ligatures under it with the needle, the eyed silver probe, or any instrument that is most at hand. Thus may he prevent the aneurism, the extravasation of blood, and the destruction of the parts.

Perhaps there are certain circumstances, however, in which this would be improper; for example, if there be a wound of the great arteries in the back of the hip, in the groin, in the armpit, we cannot command the blood easily; we are not sure of clapping our finger down upon the artery, at the very point where it is wounded; we are afraid lest the patient should die (even after we have come to him), with one single gush of blood; we therefore close the narrow wound, put its lips together, settle it with a very steady compress and bandage, and try to make the lips adhere, and then we have a fair aneurism, which we can look upon composedly; we can reflect upon the course of the wound, and calculate which artery is most probably wounded; for besides the main trunk there are other arteries in the armpit and the thigh, as the arteries of the scapula or the *arteria profunda*, which, when wounded, will form aneurisms as large, though not so dangerous as those of the axillary or femoral arteries, and to be distinguished from them chiefly by the continuance of the pulsations in the wrist or ankle.

The advantages to be derived from an aneurismal bag being formed over a wounded artery, either before we are called, or by our own compresses forcing the wound to heal, are these. That we are not hurried, all at once and unprepared, into the midst of a bloody operation; that we are somewhat easy about our patient's immediate safety, there being no danger of immediate bleeding, at least for a few days; that we have timely warning of every danger, by the changes on the surface of the tumour, which turns livid, inflames, and gangrenes, before it bursts. The wound suppurates, opens, and discharges a thin serum, before the actual blood bursts out, whence we have time to consult, to calculate which artery is wounded, and to settle all the steps of our operation as deliberately as on any ordinary occasion.

## SECTION II.

### *The operation described.*

When you are to operate on any great aneurism high in the

limb, take all the advantage that compression or the tourniquet can give you; but do not trust to them; do not allow yourself to be confounded though the blood rush out upon you; be prepared to do your operation with an intrepidity which shall make you independent of every assistance. First draw your knife deliberately and fairly over the tumour, so as the great livid bag of the aneurism, surrounded with its strong fascia\*, rises into view. Next push your lancet into the sac, and then do all that remains in your operation with great boldness; run your bistoury upwards and downwards so as to slit up the tumour quickly; plunge your hand suddenly down towards the bottom; turn out the great clots of blood with your hand and fingers, till having reached the bottom entirely, you begin to feel the warm jet of blood, and directed by that, clap your finger upon the wounded point of the artery! as it is but a point, your finger will cover it fairly, and your feeling the beating of the artery will assure you that all is safe.

Now the bleeding, confusion and fainting are over in a moment; the operator breathes, and the assistants are composed; and all the operation goes on easily and safely. The artery is effectually commanded by this pressure with the finger; but the first movement in such an operation, viz. the act of stopping the blood, of getting at the artery, is all boldness, and nothing of caution; no danger is to be apprehended, but that of suffering your patient to lose blood.

Being now composed, you take time to arrange every thing for the next step of your operation, you feel the beating of the artery with the point of your finger, perhaps you raise the point of your finger for a moment, to discover whether the pressure of your assistants, at the groin or clavicle, commands the artery: if so, you lift your finger, and examine round the artery; if not, you keep your finger steady, make the assistants clean the sac round the artery; then, if the artery lies fair and free in the bottom of the cavity, you proceed to tie it; but if not, you must dissect round the artery, until you see it free from other parts, and have it so insulated that you may put your ligature easily under it, unless, indeed, the recollection of some great trunk being near the wounded artery (as of the profunda, when you are tying the femoral artery), should stop you. But yet the nearness of any great artery or nerve is an argument as strong against your diving with the needle to catch the wounded artery, as against your dissecting with the knife. Since, therefore, the dissection is done with your eyes open, and you

\* The sac of such an aneurism is always formed by the fascia covering the limbs or muscles. S.

can see and feel before the point of your knife, rather dissect, or sometimes tear the artery naked with the point of your fingers, tie its open mouth, if cut across, as fairly as in an amputated stump; or if it be punctured only with the point of a knife or sword, put two ligatures round it, one above and one below the wound, and put them neatly and fairly round the artery, and then cut the artery across betwixt the two.

But should it happen that the parts are so confused by inflammation, so disordered by the driving of the blood in old aneurisms, or perhaps so hurt, as to be almost in a state of gangrene; if the surgeon cannot by any means get a fair view of the artery, and that his patient be losing blood, pouring from some great trunk, then he must strike his needle at random, in order to come at his object the nearest way; and the only satisfaction that he can have, or the only proof of his having tied the artery at all, will be the sudden stopping of the blood when he draws his ligature. In circumstances like these, the greatest surgeons (even Mr. Pott himself,) have been accused of having missed the artery; the artery at all events, in such a case, is irregularly and insecurely tied, the attendants that are appointed must be skilful, and must be interested; both friends and surgeons should watch over the patient's life most faithfully, for successive bleedings will happen sometimes from so slight an accident as a sudden turn, or unwary motion in his bed during the night.

Of one thing I am chiefly afraid, namely, that my description may seem overcharged; that I may appear to have exaggerated the difficulties of an operation like this; that it may be thought that an accident requiring all these precautions, and this plunging down of the hand, can hardly occur. Therefore I submit to your consideration the following case, and I dare say, you will find that it needs no apology; but that as it is new and interesting, it deserves its place.

“ A poor man, who was by trade a leech-catcher, fell as he was stepping out of a boat, and the long and pointed scissars which are used in his business being in his pocket, pierced his hip exactly over the place of the sciatic notch, where the great iliac artery comes out from the pelvis. The artery was struck with the point of the scissars, it bled furiously, the patient fainted; and in so narrow and deep a wound, the surgeon, when he came, found little difficulty in stopping it up, and less difficulty still in making it heal. The outward wound was cured; the great tumour soon formed; and the man travelled up from the north country, where the accident had befallen him, and in six weeks after arrived in our hospital here, with a prodigious tumour of the hip, his thigh rigidly contracted, the ham bended.

the whole leg shrunk, cold and useless, as if it had been an aneurism rather of the artery on the fore part of the thigh.

“ The tumour was of a prodigious size, and by that very circumstance of its being one of the greatest aneurisms, it had lost all the characteristics of aneurism. There was no pulsation, no retrocession of the blood when the tumour was pressed upon; there was nothing else peculiar in the tumour except this, that the great and sudden distention occasioned great pain; and from the continual pain, and lameness, and from having some hopes of a cure, he was ready to submit to any thing, beseeching us to operate.

“ There was little doubt of this being a great aneurism, but there was a possibility of its being a vast abscess; and it was resolved in consultation that the patient should be carried into the operation room; that a small incision should be made; that the skin being cut, the bag itself should be just touched with the point of a lancet; if found to contain matter, it should be fully opened; but if blood, then it was to be considered as an aneurism of so particular a kind, as to entitle us to call for a full consultation.

“ I made an incision two inches and a half in length; the great fascia of the hip appeared blue, and very strong, forming the coat of the tumour, and under that were seen the big fibres of the great glutæus muscle. The knife was struck into it, and large clots of very firm black blood rolled out; for such was the tenseness of the tumour, that it began to emit the clots in this way, the moment it was punctured. There was one thing further desirable, that before we put the patient to bed, we should understand the case so far as to be able to report to the consultation, whether the artery was absolutely open, and whether it was the great artery of the hip. I continued therefore (knowing that the opening I had made could be covered with the point of the thumb) to pull out a few more clots, till the warm and florid blood began to flow; I then pushed in a tent-like compress into the small wound of the tumour (viz. of the fascia), laid a broad compress over the outward wound, and put the patient to bed, with one of the pupils holding the hand upon his hip.

“ This was done at one o'clock, and at four the consultation met, and the operation was performed. And in my notes, I find two steps of the operation chiefly marked:—First, That upon our opening the tumour fully with an incision of eight inches long, and turning out the great clots, the blood was thrown out with a great whizzing noise, and with such impetus, that the assistants were covered with it, and in a moment twenty hands were about the tumour, and the bag was filled with sponges,



and cloths of all kinds, which had no better effect than the cloths which, in any accident, the friends in great confusion wrap round a wounded arm; for though the blood was no longer thrown in a full stream, nor in jets, it was seen rising through the edges of the incision; it floated by the sides of the cloths, which were pressed down by the hands of the assistants. But we knew also by a more alarming sign that the blood continued to flow, for the man, who was at first lying not flat, but supporting himself on his elbows, fell down, his arms fell lifeless and without pulse over the side of the table, his head hung down, his face was livid, he uttered two or three heavy groans, and we believed him dead.

Secondly, Seeing, in this critical moment, that if he was to be saved, it was to be only by a sudden stroke, I ran the bistoury upwards and downwards, and at once made my incision two foot in length: I thrust my hand down to the bottom of the tumour, turned off the great sponge which was over the artery, felt the warm jet of blood, put the point of my finger upon the mouth of the artery; then I felt distinctly its pulse, and then only was I assured that the man was still alive. The assistants laid aside the edges of this prodigious sac, and sought out the several smaller sponges which had been thrust in, and the sac being deliberately cleaned, and its edges held aside, I kept the fore-finger of my left hand steady upon the artery, passed one of the largest needles round under my fore-finger, so as to surround the artery: one of my friends tied the ligature, and then upon lifting the point of my finger, it was distinctly seen, that it was the posterior iliac artery, that the artery had been cut fairly across, and had bled with open mouth; that it was cut and tied exactly where it turns over the bone: and although the extremities were cold, the face of a leaden colour, and the man had ceased to groan, and lay as dead; though the faint pulsation could not be felt through the skin, in any part of the body; we saw the artery beating so strongly under my finger, that we were assured of our patient's safety; however, he was so low, that after laying down the sides of the sac, and putting bandages round his body to keep all firm, we were obliged to have a bed brought in, and having given him some cordials, we left him to sleep in the great operation room, attended by the pupils and by nurses. He passed his urine and fæces involuntarily for some days, and was long in recovering his voice.

He was cured of this great wound in less than seven months, although his cure was protracted by the foul suppuration of such a sac, and by the exfoliation of the ilium and sacrum, which spoiled, not so much from their having been laid bare by the last sudden stroke of the knife, as by the aneurismal blood having

passed upon them; the exfoliations were very large, and the sacrum especially continued exfoliating to the very day on which the wound closed.

I do not know whether this man have recovered entirely, for he left the house lame, from the contractions of the hip and ham, and walking by the help of a stick; but, however, he thought himself fit to undertake his profession, and went to England with that design.\*

### SECTION III.

#### *Rules of Practice.*

In great aneurisms, then, of the arm or thigh, when the tourniquet can be applied, do your operation deliberately, steadily, slowly, but do not needlessly prolong your patient's suffering. Cut the skin nicely, open the sac freely, dissect your artery very clean, and tie it clear of the nerve, and pass your ligature with a blunt needle or crooked probe; for whenever you are reduced to the necessity of using the sharp needles, your patient is in danger. Tie your artery with moderate firmness; tie it in two places (for on several occasions the retrograde blood has flowed out even in the time of the operation;) clean the sac; look now attentively to your two ligatures, and if you see the upper one moving according to the pulsation of the artery, all is right. Finally, if you approve of my reasoning, cut the artery across in the middle betwixt the ligatures. When the tourniquet cannot be applied, do not trust to compression. Your assistant may try to compress the artery, but do not lay your account with performing a cool deliberate operation; expect rather a dash of blood at the first stroke you make into the sac, and confusion and alarm of every kind. Compose your mind for such a scene; bend up each corporal agent to this attempt; expect safety for your patient from nothing but your own daring operation; be resolute, bold, and rapid; but let this boldness be the result of serious deliberation, and earnest consultation with your friends. And in what does this rapidity consist? Is it a dangerous stroke that you are to make? No surely: the rapid movement is merely slitting up suddenly the half putrid and tendinous sac, and turning out the clots of blood with your fingers, while the artery, nerve, and all the important parts lie safe at the bottom of the tumour. You are to

\* Dr. Farquharson, who succeeded me in the charge of the hospital, has just informed me, of this man having called upon him after his return from England, walking stoutly, and in good health.

trust much to your acquaintance with the parts, therefore make sure of your knowledge of the artery that is actually wounded; return to your books, drawings, and preparations; hold consultations with your friends; lose no opportunity of making up your mind beforehand; the more you reason upon the case, and revolve the possible dangers, the greater will be your prospect of sustaining yourself with becoming resolution in the moment of operation.\*



## DISCOURSE VII.



### OF WOUNDS OF ARTERIES.



#### SECTION I.

##### *Preliminary Observations.*

**W**HEN an artery, like that of the hip or thigh, is wounded, it forms an uncontrollable aneurism. Such an artery drives every thing before it, forms a large sac, distends more and more, till it is in danger of bursting, and if allowed to burst, proves fatal.

But when smaller arteries, like those of the fore-arm or leg, are wounded under the bellies of the muscles, the aneurism is more irregular, the operation very difficult, and the dangers quite of another kind. The blood is injected slowly among the cellular substance and under the muscles; no sac is formed; the blood is not collected, but diffused; the pulsation is slight, or there is none; the limb is swelled and hard; the skin black, as in a mortification; the blood bursts out from time to time. It is considered only as an hæmorrhagy, while it is in truth a diffused aneurism; the patient, by repeated loss of blood, is reduced to extreme weakness, and the limb gorged with blood,

\* There is no necessity for opening the aneurismal sac in those cases in which you can tie the vessel above where it has been wounded, unless the sac is very large; operate, in short, as in spontaneous aneurism. S.

and with its parts so insulated and disjoined from each other, by the extravasation, often falls into gangrene. These are the usual consequences of such a wound. If the patient escape, it is after long continued suppurations, foul sinuses, and a great destruction of the limb.

There are also certain parts of the body where the smallest arteries produce the same consequences. The axilla, for example, is a very large cavity, filled with the loosest cellular substance, fit for lodging the vessels and glands. The external thoracic or pectoral artery, which, if it lay along the temple, and were wounded there, could not do the smallest harm, is capable of forcing the cellular substance of the axilla; it has as much effect on the loose cellular substance of the axilla, as the femoral artery has on the firm cellular substance of the thigh; it has often filled the axilla completely with blood, forming a very large and dangerous aneurism. These subjects I propose now to explain to you.

## SECTION II.

### *Of Wounds of superficial Arteries.*

The radial, ulnar, and tibial arteries, in the lower parts of the limbs, lie so superficial, that their bleedings ought to be easily suppressed; awkward and imperfect operations are disastrous only from the successive hæmorrhagies, and not from the important size of these arteries.

The radial artery is one of that order and size which cannot be restrained but by the ligature. The superficial situation of this artery, the nakedness of the bone on which it lies, the great swelling of those naked and tendinous parts a few hours after the artery is wounded, the difficulty of finding the artery, and the cruelty of the operations which have been performed, make the case important, both as a common piece of surgery, and as a general example of this kind of wound.

The Radial Artery, at the place where we feel the pulse, lies quite superficial. We even see the beating of the artery through the skin, and when we dissect the wrist, or look to a preparation, we see nothing but the artery betwixt the skin and the bone; yet, when this part is wounded, we seek in vain for this superficial artery; we search for it by cutting through a most unexpected thickness of parts: this artery, which was felt so readily with the finger in its natural condition, we cannot now feel beating, even though the skin be open, and the wound deep. We observe the best surgeons at a loss to find



the artery: we find them thrusting down sponges, leaving tourniquets half screwed about the arm for many weeks; making unsuccessful incisions, diving in vain with the needle, and, at last, striking the needle through the whole thickness of the arm, so as to intercept the artery, with a coarse ligature at the distance of three inches above the wound.\* These difficulties never can be explained by attending only to the anatomy of the natural parts; here the diseased and sound state of the parts must be described together, and anatomy and surgery must go closely hand in hand.

The artery of the wrist lies not immediately under the skin, but under a thick fascia, which, in its natural state, attracts but little notice. The general fascia of the fore-arm, strengthened remarkably at the two condyles of the humerus, and farther reinforced by the tendinous expansion of the biceps muscle; descends very strong along the fore-arm, enclosing all the flesh; the fascia is very thick at the wrist, where, though it is a firm and continuous web of tendon, its glistening fibres are distinguished running across the arm, and binding down the flexor tendons. Under this fascia the radial artery lies: this fascia is connected with the tendons below by a loose and gliding cellular substance; and it is moreover to be remembered, that all through the body each artery has its own peculiar sheath of cellular substance! even the smallest muscular arteries have such a sheath. This fascia, which is itself but a firmer cellular substance, is surrounded with a looser tissue of cellular membrane, both on that surface which lies upon the muscles, and on that which is connected with the skin.

No sooner is the radial artery wounded, than the awkward attempts of the assistants prevent the blood bursting out freely; the cellular substance of the skin is injected with blood; and the skin, long before inflammation could come on, is inflated, as it were, to a great thickness. The artery shrinks under its fascia; the cellular substance of the fascia is injected with blood; it rises over the mouth of the wounded artery; it is injected not like the looser cellular substance of the skin. This firmer cellular substance of the fascia is so crammed with blood, and that blood is so firmly coagulated, that the parts are, as it were, baked together, and the hæmorrhagy is rather an oozing of blood from a substance resembling the *Corpus Caverosum Penis*. The whole bottom of the wound is a fine fleshy placenta-like mass; and, after dissecting with the knife through a great thickness of parts, the artery is not to be found; or only by those who are perfectly acquainted both with these changes

\* Mr. O'Halloran.

and with the natural place of the vessel. This is the confused fleshy-like mass, into which the surgeon strikes his needle. Here the blood is seen oozing, as through a placenta, at many places, but not one of those bleeding points corresponds with the mouth of the artery; so that when the surgeon strikes his needle at these bleeding points, he must fail. The oftener the blood bursts out and is suppressed, the more does the wrist thicken; the farther is the artery removed from the surgeon, and the more confused the parts become. It is by this extravasation into the cellular substance that the artery always disappears, and the bleeding ceases, before the surgeon is ready to take it up with the needle: the patient loses blood from day to day; he becomes pale, sickly, and exhausted, till at last the blood hardly retains so much colour as to tinge the sheets.\*

But another phenomenon often presents itself, a natural consequence of this state of the parts. A person is brought to us a week after the radial artery is wounded; it has burst out again and again; perhaps the hæmorrhagy has been suppressed by sponges, by compression, or by a rude stroke of the needle; but, upon undoing the dressings, we are surprised with the appearance of a distinct aneurism in the bottom of an open wound; we see a small distinct pulsating tumour, regularly circumscribed, throbbing strongly, with thin and almost transparent coats. We are at first at a loss to imagine how such tumours are formed or supported. But though the wound be open, the artery is not so; the cellular substance is partly injected with blood; the first effusion of blood is driven into the cellular substance, mixed with it, and firmly coagulated; the second effusion has filled more of the cellular substance with recent and fluid blood, and raised it in the form of an aneurism; and this aneurism has for its transparent coat the general fascia of the wrist; but yet it is so fairly circumscribed, that one would hardly doubt of its being a dilatation of the artery itself.

If I do not mistake the importance of this accident, it is a sort of duty to explain it to you still further; for though the operation of tying the radial, or ulnar artery, does not range in the catalogue of important operations, along with trepan and amputation, yet, if I be not deceived, it is more difficult than either, and certainly more frequently required.

“A shoemaker, having been at an annual dinner with some young men of his own trade, had got merry, but was not in-

\* Many cases may be found in White, O'Halloran, Aitken, &c. where a person, wounded in the radial artery, has bled for three weeks or a month, till the blood was little better than a reddish serum. I have taken up the radial artery after a person has been suffered to lose blood ten or twelve times during the course of a fortnight.

toxicated; and some of his companions walking home with him, he swore a hearty oath that they should not pass his door without tasting a glass. Accordingly they went in along with him, and as he was reaching up to a cupboard for a bottle of spirits, an unlucky foot encountered his, and tripped him. He fell forward, and a nail which stuck out from the wall run into the palm of his hand, and wounded the Palmar Artery. Instantly there was a dreadful bleeding. He fell down at last in a faint; and so unskilfully was this poor fellow managed, that, in the course of a fortnight, he had been allowed to bleed no less than eight times. The blood burst out afresh on the slightest motion, and at intervals of no more than two days, till he was reduced to extreme weakness. He had lost immense quantities of blood. It was only by his shape that I could perceive that he had been originally a fine athletic and healthy young man.

“ I found him, indeed, in rude hands. The surgeon who had attended him, and who was to perform the operation, knew nothing of the palmar arch, where it began, or to which of the two arteries it belonged, nor whether it lay above or under the ligament of the palm; and so much was he alarmed, and so ignorant of any but the rudest means of stemming the torrent of blood, that he had a coarse bandage twisted round the hand as firm as a tourniquet! The tourniquet itself was still round the arm hard screwed; and the hand, by long continued pressure, was now black, not merely from extravasated blood, but from actual gangrene; vesications appeared on it betwixt every turn of the roller. The palm of the hand was greatly heaved up and swelled, with a puffy kind of swelling. In seeking for the artery, the thick skin of the palm was first cut through; it was very thick, and exceedingly crammed with blood. The cellular substance, belonging to the palmar aponeurosis was crammed also with blood, was fully two inches thick, quite black; it was all one uniform mass, which cut like the *Corpus Spongiosum Penis*, and no one part was to be distinguished from another.

“ The artery, with its usual perverseness, (though it had almost bled the man to death) would not give one drop of blood during the operation. The surgeon unscrewed the tourniquet, bathed the parts with warm water; made the patient swing his hand most painfully; made several rude incisions, but still could get no jet of blood from the artery, nor any more than a general oozing from this spongy mass. Without fear of the palmar nerves, he made many relentless and unsuccessful attempts with the needle; at last he was most unwillingly forced to make an incision upwards along the artery: he cut the skin



by the side of the flexor ulnaris muscle, and looked in vain for the artery; was surprised that he could not see an artery which he felt plainly with his finger, not knowing that the artery was still covered with its fascia: but having at last slit up the fascia, the artery was forced out by the tenseness of the fascia; and from its fullness it assumed a contorted form, and was especially turgid at each pulsation. Three inches of the ulnar artery now lay exposed; it was seen running over the Pisiform bone into this spongy mass in the palm; the artery beat strongly, and was seen serpentine, and working with a sort of spiral motion, and a distinct pulsation; but there was no corresponding jet of blood, nothing but a general oozing in the palm.

“The conclusion of the case is as extraordinary as all the rest of it; the surgeon laid a ligature under this part of the artery, but would not draw it; he made another desperate dip with the needle. The lad was put to bed, and the bleeding broke out so furiously in the night-time, that had there not been a pupil watching to tie this occasional ligature, he surely must have lost his life.”

This case explains to us what confusion the continual driving of the blood makes; how deep the artery lies in parts which seem to have little cellular substance, and how vain it is to look for the artery in the midst of such a mass; the artery will not bleed till all is quiet again; and even when it does bleed, it is not with a fair jet, nor with an open mouth. To suppress such bleedings with a styptic, or a compress, seems to be a lenient, but is, truly, a cruel practice, and not without danger. The patient's constitution, if not his life, is often endangered before the surgeon gets courage to make the incision; and at every return of hæmorrhagy the cellular substance is more and more injected; the artery buried deeper; the incision must of course be more extensive, and the operation more difficult.

The aneurism which I have described, as formed under the fascia, and protruding from the bottom of the wound, I choose rather to exemplify from the writings of another person, than from my own case-book. Mr. Ford, of the Westminster Hospital, “was called to a butcher who had, about a fortnight before, wounded his wrist, by pushing his hand through a pane of glass. The wound was just below the Carpal ligament, over the pisiform bone. It had bled several times since the accident, and the hæmorrhagy had, with difficulty, been restrained by bandages and common dressings. *There was a pulsating tumour covered with a thin membrane, where the wound had been received; the pulsation was, with difficulty, checked by a strong compression on the ulnar artery, but returned again on removing the compression.*



“ I dilated the wound instantly,” says Mr. Ford, “ towards the palm of the hand, and made an attempt to include the vessel within a ligature, by means of the common crooked needle. This proving ineffectual, I represented to the patient the necessity of a farther dilatation of the wound, in order to restrain the hæmorrhage, without injury to the ligaments and tendons of the wrist; but, notwithstanding the most urgent entreaties, he could not be prevailed on to submit to any farther operation, till the ensuing day: he was therefore left with a bandage on the wound, and the tourniquet applied on the upper arm, with directions to tighten it, if the hæmorrhage should return.

“ I saw him again on the next day, in company with Mr. Lynn, surgeon of the Westminster Hospital, and finding that the bleeding had recurred, it was determined to prosecute the incision farther, and to secure the artery higher up in the arm.

“ I began the incision where the wound had been received, carrying it superficially over the carpal ligament, in the direction of the ulnar artery, for six inches upwards in the arm.

“ The operation was done with the utmost caution, to avoid wounding the tendons and muscles, which were carefully held aside with our fingers as they were exposed by dissection. This proceeding was of course tedious, in order to ensure safety. The pulsation of the vessel could not be felt; neither could the hæmorrhagy be provoked by friction, by putting the arm in warm water, or by flannels applied hot to the part. At length, however, the artery was discovered, and a ligature carried round it, without including any other part, about an inch and a half above the wrist. Some time was then employed in endeavouring to promote an hæmorrhagy from the lower branch of the artery; but this not taking place, the wound was carefully cleaned, united with strips of sticking-plaster, and rolled up with a flannel roller.

“ The patient was bled, had an opiate administered, and in every respect was treated in a most antiphlogistic manner. No circumstance occurred to render it necessary to open the wound for six days; no swelling, tension, inflammation or fever, came on. Now, it may be remarked, that the circular ligament of the wrist, together with the tendons and muscles contiguous to the ulna, had been laid bare, and exposed to the air for more than three quarters of an hour, during our search for the artery. The ligature came away on the eighth day, and the wound healed rapidly by the first intention, so that the patient was perfectly well on the twenty-eighth of the same month.”

I know Mr. Ford, and am sure he will pardon any observation that is meant for the improvement of others. I believe it is needless, in any such case, to cut downwards into the palm

of the hand, which is usually so injected with blood, that the most dexterous anatomist, dissecting deliberately on the dead body, would not find it easy to show the open mouth of an artery; and it were superfluous to repeat to you how improper it is to dive with a great needle into the palm of the hand: nor is this necessary; for the palmar fascia and skin are so swelled, as to prevent the return of the blood from the lower mouth of the artery. I never saw it necessary to tie the lower end of the artery; and I think it important to mention this, as an exception to the rule commonly laid down of tying both ends of it; it is only the direct impetus of the blood from the upper part of the artery that bursts through this injected and spongy mass; it is only the upper end of the artery that we need to tie. Irregular and unsuccessful operations are performed only from not having a very decided intention of dissecting for the artery; but it comes always to this in the end; and you should resolve, the moment you are called to such a case, to apply the tourniquet to cut backwards along the artery; to dissect it clean; to tie it fairly; to disregard the bleeding from the lower end of the artery; to put a small piece of sponge into the place where the blood oozes out from this confused mass, except in those very rare cases where he sees a direct jet of blood from the lower end of the artery, and then you may use the needle; but that rarely happens, except in very recent cases, and before the palm is much injected with blood.

## SECTION IV.

*Of an Artery wounded by a Lancet.*

It is to ignorant phlebotomists in the country that we are indebted for the various specimens of this species of aneurism. They use very blunt lancets; and a blunt lancet, being pushed rudely onwards, starts through the skin at last, and strikes deep into the arm. The aneurism is generally produced by a very large and rude wound, like that which the point of a penknife would make. I have seen many such aneurisms, and operated on several. Once, when the operation was performed by another gentleman, I saw the artery so wounded, that it was held together merely by a tag; the cut in it was indeed oblique, but so large that it had severed the artery almost entirely across:\*

\* Should the person, who is unfortunate enough to puncture an artery in bleeding, be competent, he had better cut down, and tie the vessel immediately. For it sometimes happens that no distinct aneurifinal is formed; but the cellular substance of the whole arm becomes injected, forming what is called diffuse aneu-

for the arterial coats are, in their nature, hard, unyielding, and callous :\* a wounded artery never heals : a clot is usually interposed betwixt the lips of the wound ; the blood runs freely along the canal of the artery, ready to flow through the slit upon the slightest exertion of the arm, or slightest motion of the clot ; and there lies a considerable collection of blood betwixt the wound of the artery and any compress that we can apply.

## SECTION V.

*Of aneurismal Varix.*

The aneurismal varix is a disease produced after bleeding with the lancet, by the close union of the wound of the artery with the wound of the vein, and the blood of the artery rushing into the vein through this side-passage distends it. The blood passes so easily into the vein, that little goes downwards along the artery ; the arm below is impoverished of blood, and is greatly weakened ; the dilatation of the vein increases almost to bursting ; and as the vein and artery, though they run parallel, are not in contact with each other, but are separated by the sheet of tendon named the Fascia, the communication betwixt the vein and artery comes to be of considerable length ; by emptying the dilated vein, and pinching with your fingers and thumb, you can distinctly feel the communication betwixt them.†

The artery, where it lies within the fascia, is surrounded with a set of small concomitant veins, which, from their encircling the artery, are named *Venæ Comites*, or *Sattellites* ; these also are sometimes struck with the lancet ; and, by continued pressure, the artery, the internal vein, the fascia, and the external vein, are all conglutinated together with a considerable degree of

rism ; in which case, if something be not speedily done, gangrene will come on. As this accident generally happens to ignorant persons, aneurism will generally have formed before a surgeon is consulted. If there be a distinct aneurismal sac, he may either operate in the middle of the arm, tying the artery just below the inner edge of the biceps muscle, as directed in popliteal aneurism ; or the sac may be laid open, as directed in the text. Whenever an artery is tied at the place it is wounded, which it must be in every case of diffuse aneurism, the surgeon had better introduce a probe into the tube of the wounded vessel, in order more completely to separate it from the contiguous parts.—S.

\* Scarpa mentions a remarkable case of this, in his work on aneurism, p. 349. S.

† Aneurismal varix is likewise distinguished by a hissing noise. These cases rarely require any operation. There are instances on record, in which they have existed for many years, without producing any inconvenience, the artery above the tumour becoming so much enlarged, as to carry a sufficient quantity of blood to compensate for that which passes directly into the vein. S.

confusion and thickening of parts. But however confused the other appearances may be in such a case, this circumstance will distinctly mark the nature of the disease; that in performing the operation (as there are two veins and one artery united by adhesion) the surgeon will find two successive sacs of blood, one under the other, with a small orifice of communication betwixt them. Perhaps the anomalous case related by Mr. Park, of Liverpool, was of this nature.

The young man, whose case Mr. Park describes, had been coarsely bled, was sensible at the time of being struck too deep in the arm, and felt more than ordinary pain. He presented himself three times successively at the Liverpool Infirmary. Even at the first, this was marked as an anomalous disease; for there was a complication, as if of common aneurism with aneurismal varix. There lay a small hard circumscribed tumour, no bigger than a walnut, immediately over the wounded artery, and receiving its pulsation; and there accompanied this smaller tumour a considerable aneurismal dilatation of the Basilic vein. He called a second time at the Hospital, and still the aneurismal tumour over the artery held itself distinct from the varicose dilatation of the vein. It was about a year after the disease began, that, having used too great freedoms with his arm, he was brought into the Infirmary a third time with the arm greatly swelled, inflamed, and partly suppurated; and the tumour having burst during the night following his admission, there was a necessity for performing an operation, which, considering the anomalies of the case, the late hour at which the operation was performed, and the alarming loss of blood which made it necessary, must have been very unsatisfactory to Mr. Park. But he delivers this interesting case with singular modesty; and though, in making this operation known to the profession, he has, perhaps, done no more than his duty, yet he has done it in such a manner as to deserve our gratitude. It was remarked by Mr. Park, that in the time of the operation, after opening the first sac, he saw an orifice which seemed to him to be the orifice of the artery; but he found, upon introducing the probe, that it could not pass upwards nor downwards farther than half an inch. Upon opening this second sac, he found at the back of it a second opening, a small, round, circumscribed orifice, which led into the artery. The artery, thus discovered, was tied accordingly, and the operation finished.

In this case, one of two things must have happened. The artery, the Vena Comes, the fascia, and the outward vein, must have all united together, being massed and thickened by inflammation: the ready communication of the Vena Comes,



with the outward vein, may have saved the Vena Comes from dilatation; and the circumstance of the fascia covering the dilated part of the internal vein, (and adhering to it) may have given it peculiar firmness, and may account for the internal tumour being so small (it was no bigger than a walnut;) and farther, the frequent valves in this Vena Comes, or internal vein, may account for the limited dilatation of it, and for the probe not passing easily upwards or downwards. Or, on the other hand, the artery may have begun to form a proper aneurism among the cellular substance; the passage betwixt the fascia and the vein may have continued open; the blood may have made its way from the sac of this incipient aneurism into the vein; and, if so, the blood being thus conveyed away through the vein, the force would be taken off from the proper aneurismal sac, the cellular substance would be condensed into the form of a regular bag, that bag would be saved from further distention by its free communication with the vein, and the perpetual circulation of fresh blood, through it, would prevent the formation of clots, and would also prevent the tumour assuming the proper form of aneurism.

*Mr. Park's Anomalous Aneurism.*



- 1.1. Branches of the Median Vein.
- 2.2. Branches of the Basilic Vein.
- 3.3. The Brachial Artery.
- 4.4. The Vena Comites surrounding the Artery.

- 5. Union of the Vena Comites, with the Trunk of the Basilic Vein.
- 6. The wounded artery.
- 7. Dilatation of the Vena Comes.
- 8. Dilatation of Med. Cephal. Vein.\*

SECTION VI.

*Of oblique Wounds of Arteries.*

The point of practice, which I have first of all to represent to you, is the difficulty of finding the exact place where an artery has been obliquely wounded by the slanting stab of a knife or sword, or the course of a ball. This difficulty is greater

\* A case very similar to this, occurred to Dr. Physick. See Med. Museum, vol. I, p. 65. S.

than it will be easy for you to imagine ; for sometimes an artery, being struck with the point of a knife or sword, is merely punctured, and not cut across. The obliquity of such a wound acts like a valve upon the artery ; there is but little blood poured out under the skin, and no remarkable tumour is formed : Now the surgeon, satisfied from the sudden and violent gush of blood that an artery is opened, feels himself called upon to look for the bleeding vessel, and to lay open the arm or thigh ; but presuming too far upon his own knowledge of the arteries, he makes a new incision along the course of the artery, *neglecting the more easy and obvious way of seeking for the wound in the artery, by enlarging the natural wound.\** When, for example, the artery being wounded from the outside, he ventures to seek for it by a new incision from within ; he gets to that side of the artery where no wound is ; his attempts to make it bleed, only press the slit-like wound of the artery so much the more firmly down against the flesh below ; he cannot see the wound, nor even believe that there is one ; he tries to make it bleed, but he fails ; still, he sees the main trunk of the artery lying in the bottom of the wound, beating strongly under his finger, apparently entire, and he cannot yet believe that there is any wound in it. He continues his work, but can by no contrivance force the artery to bleed ; he can never see where the wound in the great trunk is, nor be satisfied whether or not the blood flows from some smaller artery ; but no sooner does he leave his patient, than it bursts out furiously, and bleeds from time to time, till the patient expires. If I can produce one such case, it will be at once a lesson and warning to you ; and the warning will be the more impressive, in proportion to the respectable rank of the surgeon, who may have been guilty of such a mistake.

A young man of twenty-five years of age, in parrying a blow, aimed with a sharp pointed knife, at his breast, received it in the middle of his arm. The knife entered at the outer edge of the biceps, and touched the Brachial Artery ; he staggered forwards a few paces, and then, fainting with the loss of blood, fell down. Unfortunately there was no one present but a young

\* This rule has some exceptions: thus, in those cases in which, if the surgeon were to attempt to follow the wound, he would be in danger of dividing some important nerve, or have to cut through a great depth of muscle. Under such circumstances, let him dissect down to the artery at the most convenient place, as near the wounded part of the vessel as possible, and tie it firmly: should the ligature be above the wound, of course every thing will be safe; if below, in consequence of the obstruction to the circulation, the blood will immediately gush out, as happened in the case mentioned a little below in the text, and thus point out the exact situation of the wound. The vessel may then be tied in the manner directed in the text.

pupil in surgery, so ignorant that he bled him in the other arm, and tied up the wounded one, merely laying a compress upon the wound.

Till the 8th day, there was no farther alarm, when a very slight cough brought on a violent bleeding; then, fortunately, a surgeon was called, who really understood the dangerous nature of the case, and he, in his turn, called Mr. Duschamps, upon whom the care of the patient devolved; he found the arm enormously swelled, from the armpit to the elbow, and covered with ecchymosis down to the wrist.

“ At nine in the morning,” says Mr. Duschamps, “ I began the operation, the patient being seated, and every thing prepared. But behold, when I introduced my probe into the wound, it passed so far upwards towards the axilla, that I feared the wound was very high, perhaps in the Axillary Artery itself; so that instead of the operation for aneurism, I might find myself obliged to amputate at the shoulder joint. I begged to have another surgeon joined in consultation, and accordingly Mr. Sabbatier met me in the evening at five o’clock. The operation was performed in the following manner:”

Mr. Duschamps made an incision, not by enlarging the natural wound, but by a new cut along the inside of the arm, in the tract of the humeral artery, full six inches long, extending downwards from the tendon of the pectoral muscle along the arm; and by this incision he penetrated into the aneurismal bag, and cleansed it thoroughly of coagulated blood. Mr. Duschamps and his assistants, then suspending the compression under the clavicle, hoped to see the wound, or at least to be directed to it by the bleeding; but though they examined and wrought a full quarter of an hour, and although they saw and felt the main trunk of the artery beating under their fingers, they could not by any endeavours make it discharge one drop of blood; so that one of them ventured to say, he thought it could not be the main artery that was wounded; while others agreed, that nothing but a wound of the main artery could account for the first loss of blood.

In this state of uncertainty, it was resolved to lay an occasional ligature under the artery, which at any time might be used, if necessary, while the artery itself should be subdued by compression alone, with agaric and dry lint. Mr. Duschamps, first, enlarged a little the wound of the knife, and introduced his finger into it, pushing it upwards towards the axilla; and by this dissection, he applied his occasional ligature half an inch higher than the point of his finger.

Secondly, He covered all the course of the artery, within the wound, with agaric and lint, secured by an eighteen tailed



bandage; but so slightly bound that it did not suppress the pulse.

At four in the morning the blood burst out, but it stopped again of its own accord; it burst out twice the next day, and in like manner stopped again. On the third day it burst out yet again; but the hæmorrhage, which came on upon the fourth morning, was frightful indeed; the bed was soaked through and through with blood, which, from the foulness of the dressings, had contracted a horrible smell. At ten in the morning I reached my patient, says Mr. Duschamps, and undid the bandages. The agaric and lint were left in the incisions, which I had made with the knife; the lint was drawn out of the original wound; there was now no bleeding, and the patient was dressed as before; but again, at mid-day, the blood burst out with amazing force, and again it was stopped by the attending pupil. Mr. Duschamps now undid the dressings entirely, and cleaned the parts, hoping to see the wound of the artery, or at least the jet of blood, but not one drop flowed. "With a patient so exhausted," says Mr. Duschamps, "I durst no longer trust to compression; I now resolved to draw the occasional ligature, and the instant that it was drawn, the blood was thrown out with force, proving very plainly that this ligature was below the place of the wound. I applied instantly a second ligature above the first; the blood was immediately stopped, and as immediately did the patient lose every degree of heat and of feeling in the limb." At this last operation of Mr. Duschamps, his patient had lost about three porringers of blood; half an hour after, he fainted; in a few minutes he revived a little, but a storm passing over head, at this critical moment, with some loud peals of thunder, affected him so much, that, on the third hour after the operation, he expired.

"Upon opening the body," says Duschamps, "we found the brachial artery wounded from the outside and from behind; the wound was above the giving off of the profunda humeri, small, punctured, made with the point of the knife, just under the border of the great pectoral muscle; the occasional ligature surrounded the artery immediately below the wound, and that ligature, which had suppressed the bleeding, was half an inch above."

The depth and obliquity of a wound may prevent the bleeding at first; and it may not be even suspected that an artery is wounded, when suddenly, on the tenth or twelfth day, it bursts out with such violence, as to endanger the patient's life. It is not in gunshot wounds alone that this happens, where the artery is not actually open till the slough falls off on the eighth or tenth day, but in clean wounds with a pike or bayonet; for in



these only, can the delay of hæmorrhagy be attributed to the obliquity of the wound. In the practice of the older surgeons, we have many examples of this; for in their days duels were frequent, and were always fought with the sword, and when a gentleman was wounded in the sword-arm, it often happened, that although the sword had run obliquely along from the wrist to the elbow, and wounded the brachial artery at the bend of the arm, no bleeding appeared outwardly, the first issue of blood was so resisted by the cellular substance, that it soon coagulated, and filled up the narrow wound, assisted by the inflammation and swelling of the parts. A firm coagulum was formed, and it was only on the tenth or twelfth day when the suppuration was free, and the clot began to separate, that the blood burst out. Le Dran's Forty-eighth Observation, contains the case of a gentleman in the regiment of Noailles, who was thus wounded with a rapier in the sword-arm; the slight bleeding was stopped with small dossils of lint, and the next day his hand and fore-arm were in good condition. Le Dran, in examining them, found no symptoms of a wounded artery, there was a little ecchymosis towards the elbow, and a moderate swelling of the whole arm. The dossils were at last withdrawn, the cure went on well, the pus was formed, the arm was not swelled, no symptoms of a wounded artery appeared till on the seventh day in the afternoon. Being pressed to go backward, he went behind his tent with his arm in a sling, and having, in adjusting his clothes, either streightened or twisted his arm, a considerable hæmorrhagy appeared suddenly. When the consultation met next day, it was plainly seen that the artery was open, the bloody tumour now extended from the elbow to the arm-pit; Mr. Le Dran advised the opening of the tumour, or the amputation of the arm: his advice was neglected; the army made a movement; this gentleman was sent to Namure; the hæmorrhagies returned; the surgeon was long in resolving on amputating the arm, and when he did at last perform it, the gentleman was so far exhausted by successive hæmorrhagies, that he died.

This artery was found, upon dissection, to be wounded above the condyle, and a hard clot of blood, which pressed it down against the bone, prevented the bleeding.

Thus it often happens, through mismanagement, that the swelling, the hæmorrhagies, the gangrene, suddenly terminate in death; but in such wounds, the case is often protracted to a greater length, displaying, as it were in detail, all the dangers of an oblique wound.

A ball, we shall suppose, passes along the fore-arm, rakes along the two bones, wounds the radial or ulnar artery in the

bottom of a deep and narrow wound, and then passes beyond the elbow, making an opening too small to let out the blood; or, we shall suppose the oblique stab of a knife, sword or bayonet, touches an artery, lying thus in the heart of the fore-arm, under all the muscles, and close upon the bone; then the following consequences ensue. The profuse bleeding, at first, proves that some artery is wounded; the direction of the wound ascertains that it is the radial or ulnar artery; the stopping of the outward bleeding causes an internal aneurism, different from the greater aneurisms of the arm or thigh, as it lies not under a fascia, forming a fair circumscribed aneurismal bag, but under the bellies of all the muscles, which are separated from the bones, by a very irregular and a very dangerous collection of blood. The outward bleeding is soon stopped by compresses and a bandage; the friends are less alarmed, seeing nothing but a narrow slanting wound; but when the next morning they see the arm black with the injected blood, and swelled to an enormous degree, their fear is like their indifference before, quite ignorant, and beyond the true measure; they believe this to be an absolute gangrene, and that the patient is lost; while the surgeon sees in this blackness, not the signs of gangrene, but the marks of a wounded artery, and foresees a difficult and tedious operation of seeking it out.

But if again the surgeon have not the skill to perceive all the dangers of the case, the apparent gangrene is soon changed into a real one; the limb becomes cold, benumbed, and has a livid redness upon its surface; the skin without runs into a low inflammation; the blood within increasing every day in quantity, corrupts and bursts out; and thus, as I have hinted before, it is not merely by the wound of its great artery, and by losing the great trunk that nourished it, that a limb is lost; but in a case like this, it is lost by the deep driving of the blood among the flesh and bones. Either the outward bleeding is allowed, and the patient is in danger of immediate death, or the blood is confined, and the bleeding goes on within: so that every time the artery bursts out, the limb is injected anew, as it were, by the arteries. The matter is bloody, fetid, corrupt; it prevents the reunion of the bones (if any bones be broken;) it makes foul suppurations, and extensive and fetid sores; and each new suppuration is succeeded by a dissolution of those clots which had for a time stopped up the artery, so that again the blood bursts out; till at length, after many months of suffering, the patient is forced to part with that limb which he has undergone so many dangers to preserve. The extensive sinuses, and foul sores, the disorder of the joints, and the total caries of the bones, make every such case incurable; there is,

even from the very first moment, no other alternative for the surgeon, than either to perform immediately a bold decisive operation, or to resolve at once (not keeping the patient in this lingering and cruel condition) to cut off the limb. To the patient himself, the question may be honestly proposed in these terms: "Will you have this tedious, but necessary operation, of tying the artery, regularly performed? Or will you, to shun a present pain, linger for months in this miserable condition, consenting at last to lose the limb, when it is perhaps too late to save your constitution, or even your life!"

The thoracic artery, though small and apparently unimportant, produces often the most distressing consequences when wounded, and requires a bold operation. This arises from the looseness of the cellular substance, which surrounds the great vessels and nerves in the axilla; and such is the power of this long and slender artery over the cellular substance, that it drives its blood freely under the pectoral muscle. The aneurism which it forms, is as large sometimes as that of the thigh. It often happens, after a wound of the thoracic or external mammary artery, that the whole side is blackened with the suffusion of blood; the great cavity of the axilla itself is filled with blood, (and it is capable of containing a great quantity) the back and breast are black with the ecchymosis. The appearance is so formidable that the surgeon suspects some mortal wound; the side is so loaded with blood that the patient is oppressed, and he labours so in his breathing, that we should believe him wounded in the thorax, but that there is no cough, nor blood coming up from the lungs, nor emphysema from air issuing by the wound. From the size of the aneurism in the axilla, one would, on the other hand, be apt to believe the axillary artery itself wounded, but that the pulse at the wrist continues firm. When the axilla is thus filled with extravasation, and the back and breast blackened with ecchymosis, a gangrene of the skin must sooner or later ensue; the discharged blood will become foul and very fetid; the destruction of cellular substance, and the irregular abscesses, must extend far and wide; the disorder will be several months in being cured; it arises from ignorant surgeons thrusting their stopples of lint into that wound, which is very distant from the place where the wounded artery lies, which of course continues to bleed within.

This must be prevented. It would no doubt be very wrong to cut up the axilla, or touch the pectoral muscle in pursuit of every trivial artery that may be wounded on the fore part of the breast; nor would it be sensible always to make incisions when the long pectoral artery itself is wounded; for often the thoracic arteries, when wounded with swords or musket shot, bleed



very smartly, and yet stop of their own accord, upon applying merely a piece of lint to the wound. Indeed it is not on account of the actual wound of the artery that we perform any operation, but to prevent the destruction of the cellular substance and the diffusion of the blood; therefore, when you find that applying a piece of lint with slight compression stops the bleeding, without any appearance of extravasation, you remain satisfied. But if you be called to your patient a few hours after the first dressing, on account of an incipient swelling and slight oppression of the breast, and find that the extravasation among the loose cellular substance in the armpit is begun, you must undo your bandages, withdraw your bit of lint, which is merely a stopple confining the blood, dilate the wound, put in your finger and advance it till you feel the jet of warm blood; hook out the clots which lie over the mouth of the artery, and lay your compress directly upon it. Then pile compresses over it on the outside, and apply your roller; for it is seldom necessary to cut the wound entirely up, or to use the needle in wounds of the thoracic artery.

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## DISCOURSE IX.

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### OF THE ANEURISM FROM ANASTOMOSIS.

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**T**HAT kind of aneurism which I venture to name Aneurism from Anastomosis, resembles those bloody tumours which appear in new-born children, occupying chiefly the lips, cheeks, eyelids, or hairy scalp, and which grow in process of time to an important size, bursting at last, and bleeding furiously, so as to oblige us to cut them out.

The disease which I am now about to describe arises, not only from such natural deformity, but also from various and hidden causes: it often begins in adults, increasing from a trivial



pimple-like speck, to a formidable disease. This aneurism consists in a mutual enlargement of the smaller arteries and veins.

I have reason to believe that it sometimes originates from so slight a cause as a tight hat or a trifling bruise; it frequently begins in adults, in pure, hale, and sound skin, where no spot, nor mark, nor tendency to disease, had ever been observed. The marks which children are born with are often superficial stain-like spots, which never change, except that their colour becomes occasionally deeper. But sometimes those spots are also defects in the substance of the skin, they are a species of aneurism, or they create a tendency to this disease; and from almost imperceptible stain-like spots, not elevated above the surface of the skin, they grow to dangerous bloody tumours, which require extirpation.

In both diseases, viz. of connate aneurisms appearing, when the child is born, in the form of a small livid tubercle, and of those forming spontaneously or arising from a blow, the process of their growth and increase is the same. When a set of cutaneous vessels first enter into this diseased action, a few of the extreme arteries in the skin itself are originally in fault, and commence an increased action, which draws the arteries of all the adjoining parts into sympathy with them; the arteries behind them convey more blood and push it on rapidly; these larger arteries begin to feed the disease, while the central group thus supported by the arteries behind, acts powerfully, the tumour begins its pulsations, and, like a *punctum saliens*, forms vessels as it were, by enlarging those small branches which were not visible before. The little arteries work powerfully and are dilated, the corresponding veins are proportionably enlarged, the number and activity of those arteries and veins are slowly increased. This increased circulation solicits more blood towards the tumour; and while the central branches impel their blood with greater rapidity, the trunks they come from, follow up that action and work so as to keep them full.

In women, the phenomena of these tumours are very remarkable; the hæmorrhagy from them usurps the place of menstruation, the action of their vessels is as regularly periodical as that of the arteries of the womb. The state of menstruation is a state of general excitement, and the particular action may be turned off towards any set of vessels, as those of the stomach, nostrils, or lungs. The excitement of menstruation affects the breasts, it is felt through the whole system, its effect on every tumour is remarkable! and I am daily provoked at seeing cancers, even of the breast, (which is always peculiarly affected), and other tumours which actually rise and fall with each menstruation, extirpated without the smallest regard to the menstrual pe-

riod, though the change at such a time upon every tumour is such as the most ignorant observer might remark. The disease which I am now explaining, this aneurism from anastomosis, consists in the increased action of certain arteries; and the menstrual excitement, and the local action coinciding, cause periodical pulsations, periodical enlargements of the tumour, periodical hæmorrhages, and a bursting of the tumour at each menstruation, which alternations I have known continue for many years.

Having endeavoured to settle the character of this singular species of aneurism, I shall proceed to relate, in the first place, a pure unencumbered case.

Mr. R—n, a young gentleman of about twenty-five years of age, had an aneurismal tumour upon his forehead, which had been growing for seven years. It began with a small spot like a pimple, of the size of a pea, and was, when he consulted me, of the size of an egg; there passed along the centre of the tumour the scar of an operation which had been performed about a year before. Nothing could be more singular than the circumscribed form, strong pulsation, and various peculiarities of this aneurism. Nearly seven years before, he had first observed a small pimple-like tubercle rise on his forehead (which had hitherto been smooth and sound), which was seated close upon the eyebrow, and was so small and so little troublesome, that he believed it to be a pimple merely, ascribed it to the tightness of his hat, and disregarded it for some time. When he consulted a physician of very excellent abilities, Dr. Cleghorn of Glasgow, that gentleman ordered gentle physic, and other trivial prescriptions, in perfect confidence that it would disappear; for at this time it was of the same colour with the rest of the skin, had no character of aneurism, and was so little troublesome, that it was for a long while after entirely disregarded. But when it had attained to the size of a sparrow's egg, he thought he felt pulsation in it at times, he began to be alarmed; and when at last he resolved to consult a surgeon, the pulsation was manifest, the surgeon recognized it as an aneurism, and advised that it should be cut out, but not with that earnestness which is necessary to persuade a patient, who seldom has at first a serious impression of the nature or consequences of such a disease. Mr. R—n advised, or rather talked, with others, but in so careless a way, that he began to be himself indifferent about the tumour, was easily prevailed upon to believe that if it increased at all, it must be very slowly; this little tumour seemed at first to have arisen merely from a tight hat, and he was easily persuaded to hope that it would go away.

One gentleman directed him to try compression, and accordingly, a plate of lead was bound firmly down upon the tumour;

he suffered the pain of this pressure with great constancy for some days, and for several weeks he continued a less painful degree of pressure; but finding the aneurism beating more powerfully, foreseeing no good effect, and irritated with the constant and ineffectual trouble of supporting the pressure, he threw away the bandage, and let the aneurism grow as it pleased. This was about seven years ago; during five years had his tumour continued to grow, when the nature of it being no longer equivocal, and the consequence of allowing it to increase, much to be feared, it was resolved to perform the operation. There is every apology for the theory which the surgeon had formed of this tumour, for its form was very singular. It was seated immediately over the eyebrow, and was about the size of a small egg; it lay exactly in the course of the frontal artery. The small orbitary artery was found entering into the lower end of this oval tumour, while a branch of the temporal artery, remarkably enlarged and tortuous, went curling along the temple and passed also into the upper end of the tumour. No other vessels, neither arteries nor veins, could be traced to it, but these two arteries, and the intermediate tumour beat in concert; the arteries beat much more powerfully than in their natural state, and the tumour had a very powerful throbbing. This tumour, which became turgid whenever the pulses beat strong, seemed to be merely an enlargement of the frontal artery, (vid. fig. 1. p. 108.) and under this apprehension was the operation arranged as follows: The surgeon first made an incision in the lower part of the tumour, and passed a ligature under the orbitary or frontal artery; but when he had tied this artery the pulse of the aneurism was nothing abated. He next made an incision along the temporal branch, where it ran into the upper part of the tumour, and tied it also with a ligature, but in vain; the pulsation of the tumour was still unaffected. It was then necessary to operate upon the tumour itself; it was opened its whole length, and bled very profusely; one ligature only was used, that ligature was struck with the needle into the centre of the tumour, where there was one artery larger than the rest; but from all the surface besides there was one continual gush of blood; the hæmorrhagy was repressed, and the wound bound up with a compress and bandage. The tumour in short was thoroughly cut open, but it was not cut out. It healed slowly, the ligature came away with difficulty; after a fortnight the patient was left to dress the wound himself; he felt distinctly, before the wound was healed, that the pulsation had begun again; the pulsation became very strong, and the tumour, by the time the wound was actually healed, had attained the full



size it had before the operation ; it was indeed rather larger than before.

But it might easily have been perceived, that this could not be a mere dilatation of the frontal artery, for the tumour was some thousand times the diameter of that artery. The pressing the point of the finger upon both arteries stopped their pulsation, but did not in the slightest degree affect the tumour ; and since the striking a needle and ligature under each artery, did not affect the pulse of the aneurism, it was plain that the tumour was of such a nature, as to draw its blood from a variety of sources, and that it was necessary, not to cut it open, but to cut it out.

For nine months longer the tumour was suffered to grow unmolested. When Mr. R—— first desired my advice, the character of the tumour was very strongly marked.

It was very protuberant from the forehead, of a regular oval form, about the size of a small hen's egg. The scar of the former operation, about three inches long, ran across the centre of the tumour. The tumour was not purple on its surface, like the flesh spots of children, it was covered with a firm and sound skin ; the scar was white, the rest of the skin was of a deep red, from inflammation, and not from the blood appearing through it ; its throbbing was exceedingly strong, and of late it had become very painful, so that he was in fear of the bursting of the tumour, or the corruption of the bone ; it was from the pain, which had of late been considerable, that he was inclined to ask advice, or to submit to a second incision. The notes taken at this period, in relation to the appearance, size, and pulsation of the tumour, are as follows :

The lower artery, the ocular, which comes from within the orbit, is very large, and is felt entering into the lower corner of the tumour ; the temporal branch is very greatly enlarged, is remarkably tortuous, pulsates with great force, so that I am surprised it has not wrought out other aneurisms near this first one. He wears his hat quite off his face ; when his hat presses upon the tumour, it increases in size ; when he runs, when he is heated, when he stoops, when he breathes hard, it increases in size, and its pulsations are very strong : when he drinks spirits or wine, it swells, pulsates, assumes a deeper tinge, and every person at table can perceive the change ; and when I handle it rudely, it swells up, and when he chooses to retain his breath, it is inflated like the gills of a turkey cock. It is only for ten days that the throbbing pain has been remarkable, but that pain increases, and as it runs backwards along the course of the artery, it is, by compressing the artery, in some slight degree relieved.

Were this aneurism a mere dilatation of one artery, it should

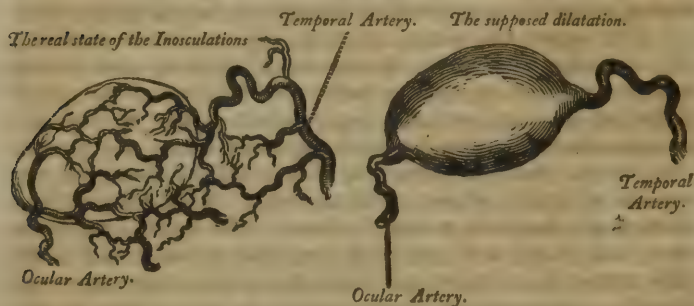


be emptied at once by compression, and the continuing of that pressure, should prevent its being filled again. But when it is compressed firmly, it yields very gradually, as if the veins received its blood; the compressing of its two great arteries, does not prevent its filling again; you are able to suppress their pulsation, but the aneurism still pulsates, it throbs from the bottom, it rises very gradually when you cease from pressing, and soon fills to its full size; it seems to receive its blood from one knows not what sources, from small arteries which cannot be perceived. The sudden inflation of this tumour, like the gills of a turkey cock, its various fulness, according to the season of the year, its falling in autumn when the blood is low, and its rising in the spring when the circulation is rapid, the variations of it in respect of fulness, and its colour varying according to the degree of turgescence, its sudden puffing up upon taking wine or using exercise, its slow subsiding, and yielding in some slight degree by pressure, and its being so little affected by compressing the great artery which feeds it, are sufficient indications of its nature. All this proves, that it is a tissue of small arteries and veins, it fills not like a varix, slowly; there is, indeed, no dilated vein to be seen near it; its filling is by distinct throbs, it is filled by its small and numerous arteries, and its swelling is (like the erection of the penis) produced by the pulsations of the arteries, stroke after stroke, pouring out their blood into the cells.

With this view of its nature, I was sure that it was a kind of tumour which was not to be cut open, but to be cut out. Dr. Jeffrey, and Mr. Cooper, surgeon in Glasgow, had the goodness to assist me. I tied this rampant temporal artery before touching the tumour, that it might be once more ascertained how little this interruption of any one artery could affect such a tumour. The pulsation of the tumour was nothing affected; I knew by this what sort of an enemy I had to deal with; I knew, that if I cut within the active circle of this tumour, I should have innumerable branchings of the artery to tie up; but that if I cut wide where the arteries were undivided, and before they had formed their anastomosis, I should have to deal with but one or two. I disregarded the bleeding, I knew that I had no means of saving blood but by making the operation rapid. I made an oval incision which comprehended about a fourth part of the surface of the tumour; dissected the skin of each side down from it rapidly; I went down to the root of the tumour, and turned it out from the bone. The tumour was a perfect cellular mass, like a piece of sponge soaked in blood; it was tolerably solid, and dissected out very clean, in the form of a regular tumour; it bled furiously during the operation (that I had resolved to disregard), but the moment the tumour was

turned out, there was not one drop of blood, the surface was clean, the pericranium quite bloodless, the lower artery stood wagging out of its hole in the orbit, and I held it with the hook while Dr. Jeffrey tied it. The upper tortuous artery was also tied; the eyebrow, which was divided exactly in the middle, was brought nicely together, the incision healed in ten days; the wound has been now two years healed, and the scar is small, reddish, and very little perceptible, and the two extremities of the eyebrow, which were two inches distant in the time of the operation, are perfectly close.

*Plans of the Aneurism of the Forehead.*



But there are varieties of this disease, which nothing but a variety of cases can explain; and one consideration should give us a particular interest in investigating its nature; that if neglected, it becomes incurable, and when it is incurable, I think it cannot fail to be in time fatal. It becomes incurable, when having been operated upon with a partial incision, instead of being extirpated, it is but irritated, and grows till it spreads its roots among the adjacent parts. It becomes incurable when it occupies a great extent of skin: It is an incurable disease when it affects any of the viscera. One phenomenon of this disease, I think, is very remarkable; often, in the course of this disease, various sacs are formed, which receive sometimes serum and sometimes blood, according to the state of the tumour, so that tumours of this kind sometimes burst like a ganglion, or great salivary tumour, discharging a thin serum like saliva.

This kind of aneurism sometimes grows in the limbs, and to a very remarkable size: bleeds profusely, and reduces the person to extreme weakness, and yet is easily cured; for the rule which I have laid down, gives you a perfect command of this aneurism. You must not cut into it, but cut it out. If you merely cut into it, the hæmorrhagy is terrible, and the cure imperfect; if you cut round it, and at a little distance from its

root, in place of the profuse hæmorrhagy, from numberless arteries, you have but a slight bleeding from one or two, which are extremely small.

A tumour of this kind, which had grown to a remarkable size, and done infinite injury to the constitution of the patient, was extirpated by my friend Mr. Harkness. The history of it is as follows :

“ Jean Smith, a house-servant, about thirty-nine years of age, had a tumour upon her arm of a very singular appearance. It was seated exactly over the middle of the triceps muscle, on the back part of the arm ; but the disease belonged merely to the skin. The tumour had a very firm fleshy basis, and a sort of dead and throbbing pulsation through the whole thickness of it. The tumour had something of the appearance of a scrotum, with an enlarged testicle : It was about eight or nine inches long ; the walls of the tumour were very thick and fleshy ; there seemed to be a sac, or rather many sacculi within the tumour, but quite flaccid. The tumour hung down flabby and pendulous ; it was of a livid colour, as if it contained blood, or the remains of blood ; where it was not blue, like a vein, it was mottled of a deep red, or lakey colour. This tumour had burst often, and poured out prodigious quantities of blood, and at the place where it had burst, and especially at one point, where the blood had always of late been poured out, the surface of the tumour was covered with thick white scabs, as if the bleeding orifices had been plastered up.

The history of the tumour was singular. It was about eighteen months before, that there had appeared a small purple spot upon the back of the arm, which soon grew into a tumour. The tumour enlarged slowly, and had, in the course of five months, attained to the size of a hen's egg ; then, for the first time, it burst, and discharged a great quantity of blood. The blood was red and florid, and thrown out with great impetus ; but it stopped of its own accord. It increased in size from this time forward very rapidly, and in four days more it was thought necessary, by the surgeon in the country, to open the tumour. This was done by incision ; there had been a sac formed, even at this time ; a great quantity of coagulated blood was taken out, the hæmorrhage was very profuse, from the whole surface, but no particular artery was seen. No vessel, great or small, was taken up ; the hæmorrhagy was stopped with flour, firm compresses, and bandage. The wound was healed, the tumour grew, and, from the size of a hen's egg, it increased in a few months to its present dimensions, of eight or nine inches in length, and six or seven in breadth.

But this incision never healed entirely ; a succession of scabs



formed upon that part of the tumour, and from time to time the blood burst out from it on the slightest accident or injury, and most infallibly the hæmorrhagy returned at every menstruation.

Her menses continued regular; at every menstrual period she was sensible of a heat, pulsation, and swelling in the tumour; at each menstruation, blood burst out afresh from the central opening; she lost immense quantities of blood, but still the menses held on their regular course, and flowed in due quantity.

About three weeks before she came under the care of Mr. Harkness, she had her menses, the blood again flowed in the usual quantity from the tumour in her arm. The blood burst out again from her arm just two days before this second operation was performed. The bandages which had been kept firm from the time of the last hæmorrhagy, chanced to be loosened and thrown aside; the blood, on the day of menstruation, and just two days before the operation, burst out impetuously, and she lost no less than four pounds of blood.

OPERATION.—This hæmorrhagy was so dangerous, and implied also something so peculiar in the nature of the tumour, that Mr. Harkness very prudently called together a full consultation, especially of the older surgeons. The tourniquet was applied, the foul cloths and tight bandages were taken away from the tumour. It hung like a thick and massy bag half empty. Mr. Harkness did not set about the operation without a degree of apprehension, nor were the gentlemen, who were convened to see the operation, without fear of a very troublesome hæmorrhage. Mr. Harkness went round the base of the tumour with two strokes of his knife; he separated the tumour very rapidly; when the tourniquet was slackened, there was not the smallest hæmorrhage; the place where the tumour had been, remained almost clean of blood; one small artery bled smartly, and was taken up with the tenaculum. Those who had seen the alarming hæmorrhagy of the preceding day, were astonished, while those who saw the tumour for the first time, and had been called together as to an important case, were almost offended to find themselves so formally summoned to attend on an occasion of so little danger.\*

When such tumour is seated among the viscera, or in any inaccessible part, it must be an incurable, and, in the end, a fatal disease. It is likewise incurable in those cases when, although occupying an external surface, it is of such extent that

\* Upon dissecting this tumour, I find it like a placenta, stringy, cellular, consisting of a confluted tissue of small arteries, veins, and cellular substance, like the substance of the placenta, or of the womb.



no operation can be performed. But in all cases in which an operation is practicable, the rule is, “not to cut into them, but cut them out.”

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## DISCOURSE X.

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### ON FRACTURES OF THE LIMBS.

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#### SECTION I.

#### *Of the Formation of Callus.*

**A BONE** is a well organized part of the living body; that matter, which keeps its earthy parts together, is of a gelatinous nature; the earth of bone, to which it owes its hardness, strength, and all its useful properties, is deposited in the interstices of this gluten, undergoing a continual change and renovation; it is incessantly taken up by the absorbents, and secreted again by the arteries. It is this continual absorption and deposition of earthy matter which forms the bone at first, and enables it to grow with the growth of the body; it is this unceasing activity of the vessels of a bone, which enables it to renew itself when it is broken or diseased; it is, in short, by various forms of one secreting process that bone is formed at first, is supported during health, and is renewed on all necessary occasions. Callus is thus a regeneration of bone, organized by the same action with that by which the original bone is formed. The callus begins to be formed after a fracture, as soon as the continuity of vessels is re-established, and their healthy action renewed.\* It is not a concrete juice, deposited merely for the occasion of filling up the interstice betwixt fractured bones, but a fair regeneration of new and perfect bone, with its needful apparatus of arteries and veins, and of absorbents, by which its earthy matter is continually changed like that of the contiguous bone. Callus, indeed, could hold no connexion with the con-

\* Of course, the length of time which intervenes between the accident and the formation of the callus varies; where the inflammation is inconsiderable it probably commences in a few days; but where that is violent, even though no matter is formed, this process is delayed until the inflammatory action subsides.—S.

tigious bone, were it that inorganic concrete which was once supposed.

It results from this doctrine, that callus is established in a renewed continuity of vessels; that a soft, flexible, and vascular substance is interposed betwixt the ends of the broken bones; that a sort of temporary gland is organized for the generation of bone, or, to speak not figuratively, but philosophically, it seems as if, by this reunion of all the adjoining parts, the original constitution and proper organization of a bone were restored. But for some time the secretion of earthy matter is imperfect; it is infant bone, soft, flexible, of an organization perfect for all the purposes of bone, but as yet delicate and unconfirmed; not a mere concrete, like a crystallization of salt, which, if interrupted in the moment of forming, will never form; not liable to be discomposed by a slight accident, nor to be destroyed entirely even by a rude shock. In its organization so far perfect, that when it is hurt, or the bony secretion interrupted, the breach soon heals like the adhesion of soft parts, and so the callus becomes again entire, and the process is immediately renewed.

But as this is a theory which is to have some influence on your practice, it must not be slightly treated; but must be supported with something more substantial than hypothetical reasoning. I shall proceed, therefore, to state facts.

Towards the end of the cure of a fractured limb, the patient becomes careless and confident, and often by his playing tricks with his crutches, or by the crutches slipping or breaking through his negligence, he loses his balance, throws all the weight of the body suddenly on the weak limb, and thus breaks it a second time. And here a phenomenon presents itself, which very strongly confirms our doctrine. It is, indeed, contrary to the vulgar opinion, but yet it is certainly true, that when a limb is broken a second time, it reunites more easily than at the first, and when broken a third and a fourth time, heals still faster and faster. A little girl, a daughter of Mr. Y. had her arm three times broken, and at each time I found it unite in a shorter period than the preceding. A young man, a servant with Mr. G. having broken his leg, it bent and broke under him three successive times, and at each successive fracture it healed more and more easily.

“An officer, whose leg had been reduced by a French surgeon, and who was recovered so as to walk abroad, fell and broke it a second time, about the fiftieth day of the cure. The limb being reduced and laid again in splints, was so well ossified in twelve days, that the surgeon took off the splints, the patient was able to lift his leg; it bore its own weight quite ea-

sily, and by the twentieth day it bore the weight of the body ; he walked abroad, used all manner of freedom, and was cured a second time, and by the twenty-fourth day, he was able to walk without any other help than a cane. But this ill-fated leg was destined to be broken a third time ; for, this gentleman having mounted his horse, in order to go and join his troop, the first step of his journey was a disastrous one. His horse plunged in among some clay ; he fell ; and the horse, in kicking to clear himself, broke both the boot and the rider's leg.\* This third fracture was still more easily reunited than the second ; for in less than six weeks, he went to his regiment with the leg strong and firmly joined, and so accurately, that it was not easy to distinguish the broken leg from the sound one."

In all these cases the limb yields ; it bends under the weight of the body ; it is broken so that it can no longer support the body, but without any snapping or sharp splintering of the bone, and, in general, without any overshooting of the bones, and without crepitation. It is chiefly by the change of shape in the limb, by its bending somewhat, that you know it to be broken.

Every accident of such a case is perfectly consistent with the doctrine which I have laid down, and proves it very strongly. Callus is really more vascular than bone ; and of this we are assured by various proofs. Having cut off the limb of a soldier, whose leg had been broken in America twelve years before, I found, upon injecting the bone, that while the bone itself received the red colour of the injection pretty freely, the callus, which goes in a zig-zag form, joining together the several ends and points of a very oblique fracture, was very singularly red. The callus, then, is more vascular than the bone which it belongs to, even at the distance of twelve years from its formation. This callus, unconfirmed at the time that it is broken, is soft, and very highly vascular. When the callus breaks, many of its vessels are ruptured, but some are only elongated, and it rarely happens that its whole substance is torn. You may easily imagine how much more readily the continuity of vessels will be renewed within the substance of the limb, when the bone or callus is surrounded by vascular parts ready to swell and close up the breach, than in any external wound. When we consider the perfect vascularity of a callus, the excitement which must follow this partial rupture, and the full and vigorous circulation in vessels accustomed to the secretion of bone,

\* The meaning of the horse breaking the boot, as well as the leg, will not be understood by those who are not acquainted with the peculiar manner of accoutering a bidet or hack-horse in France. It has two large fixed wooden boots, slung on each side of the saddle, and when the rider mounts, he thrusts his leg, boot and all, into these wooden boots.



we understand why a fractured callus is more speedily reunited than a broken bone, where nothing is prepared for the generation of new bone.

I think I cannot illustrate the condition of a callus, at the time that it is broken, better, than by comparing it with the condition of a bone, where, by the perpetual restlessness of the patient, a proper callus has been prevented, where the bones have covered themselves with a sort of cartilage, and an unnatural joint has been formed; where the surgeon makes an incision, turns out the ends of the bone, pares off the callus from each end of the bone, returns the pared ends of the bone again into their place, and lays them among the flesh, opposite to each other, and sews up the wound; then adhesion takes place, the communion of vessels, from bone to bone, and also the continuity of all the surrounding soft parts, is restored; then all the surrounding vessels are drawn into action, a mass of parts, active and in high circulation, is formed round the broken bone, the blood and humours are worked towards it, and the vessels of the bone itself being thus supported in their new action, the ossific process is renewed with great energy. This is the result of an experiment, or rather of an operation, which has been several times performed, and particularly by Mr. Park, of Liverpool,\* and is a fine analogy for explaining the condition of a fractured callus; for in proportion as the organization is advanced, and the parts full of blood and in high excitement, the second fracture is more rapidly re-united than the first.

This accident, of breaking the leg a second time, is in no case so grievous a misfortune as might be imagined; in a very ill-reduced fracture, I should rather esteem it fortunate. It was the practice of surgeons in all ages, to snap the limb across their knee whenever they were ill-pleased with the shape of it; and although, in the present day, such a practice would be esteemed a mark of the grossest ignorance, it is but one example out of ten thousand, where opinions which now pass only among the vulgar, may be traced to the highest and most respectable authorities.

That the ancients had very generally engaged in this practice, I could easily prove by direct authority: and men of the first eminence in our profession, the very best surgeons in the world, have been in the practice of performing this operation. "I was

\* This operation has so frequently failed, that it is, I believe, never now performed. But to Dr. Physick, of Philadelphia, we are indebted for the discovery of another, much more easily performed, and likewise much more successful. He advises a seton to be passed between the fractured ends of the bones, and to be retained there until a considerable and sufficient degree of inflammation is excited, when it may be withdrawn, and the limb treated as in a case of recent fracture. S.



called," says La Motte, "to a young man of sixteen years of age, who had the thigh-bone broken seven or eight weeks before, and it was so re-united that he could not walk; the broken thigh-bone was shorter by half a foot than the sound one, and he called me, in order to learn whether some sort of shoe might not be invented, by which the leg might be raised so as to enable him to walk.

I found the bone broken about the middle of the thigh; the bones were so awkwardly joined, that they absolutely crossed each other. There was a great elbow looking outwards, and a proportioned hollow within; but the lad being young and healthy, and the callus as yet soft, I formed the resolution of setting the thigh-bone again, in its right shape, by extension and counter-extension; for I knew that the attempt could do the boy no harm, and I remembered from the accidental breaking of the callus, that the callus was long of obtaining its perfect consistence. So, having made his bed, and prepared bandages and splints, I made a powerful extension by the help of my young men, and pushed in this elbow with the flat palm of one hand, and resisted with the other. I succeeded perfectly to my mind, so that, without one cry from the lad, I reduced this angle, and made his fractured thigh as straight and as long as the other. In a month he was freed from his splints, and walked without pain or halting, while his thigh was as straight as an arrow."\*

From this history, I draw no rash conclusions. I do not propose to break limbs when they are almost healed, that they may heal faster; nor to take even a crooked and unserviceable limb and lay it across the knee, like La Motte; but I do, with perfect confidence, advise you, to leave off bandages, which you see were originally designed for no other use than to mould and fashion the callus; to reject those long compresses, which were bound so firmly round the limb for the same purpose; to use such splints only, as when laid along the whole limb, may serve to maintain its posture, and preserve it steady, and to tie

\* The following case, which occurred to myself, is somewhat analogous to that of La Motte.

Upon my return to this country from Europe, I found in the family of one of my relations, a little girl about ten years of age, whose thigh had been fractured about a month before, by a fall from a cherry-tree. The limb had been so badly set, that the fractured ends of the bones over-lapped each other about an inch and an half, and the limb on that side was consequently that much shorter than the sound extremity. As the effect of this would have been lameness for the rest of the child's life, I proposed breaking the extremity, as from the age of the patient I had no doubt of its re-uniting. As there was an appearance of cruelty in the proposal, the family would not agree to it. Upon this, I recommended that the patient should have a pair of crutches, and be allowed to walk about. This was accordingly done, and in a few hours I was informed, she had slipped down, and that her thigh was again broken. I now treated the fracture, and she got well in the usual time; and no difference is now perceptible between the limbs. S.

those splints slightly with tapes; to lay out a broken thigh (since it cannot be commanded by splints) smoothly upon a pillow, and to venture, without fear of hurting the callus, to extend the limb anew, and lay it straight when it is disordered and shortened. In a simple fracture of the leg, it is almost sufficient to lay it on a pillow; and you have done every thing when you have laid it lightly and easily in a smooth splint of pasteboard; then the patient himself is almost able to keep it right. In fractures of the arm, the part hangs naturally in the best posture, and requires but two splints of thin pasteboard, rolled gently with a linen roller; and in fractures of the forearm also, the limb preserves its natural length and natural form; it requires merely to be laid upon a long splint of pasteboard, with a smaller splint above, the two splints secured with slight tapes or ribbons, and the arm slung round the neck.

Dismiss, then, those anxieties about the manner of rolling, and the express degree of firmness which the bandages should have; look no longer thus anxiously at the points of the fingers or toes, to see whether the bandage presses properly, so as to make those parts swell; you are not to draw the roller, so as to straiten the limb up to the very point of producing gangrene, nor to use any bandages that are formidable from their straitness, nor any that are even firm, except in children, in drunken people, in maniacs, or in those who are delirious with fever or pain.

## SECTION II.

### *Definition of Fractures.*

Having corrected some prejudices, and initiated you into the history and theories of this interesting subject, I propose next to lay before you the various characters and distinctions of fractures.

First, *Simple fracture* is that in which the bones, though broken, do not protrude. The soft parts, though inwardly torn, are but little injured. The periosteum is not separated in any remarkable degree from the bone; but the periosteum clings to the bone, the tendons and muscles to the periosteum, and the surrounding soft parts are so compressed around the fracture, in consequence of the limb being entire, that adhesion soon takes place among them. The interstices are filled with a gelatinous effusion, which soon becomes organic, and the continuity of vessels is immediately restored. Even in a comminuted fracture, each little piece of bone retains its connexion with the soft parts, and lives, and is nourished, and re-united with the bone to which it belongs, so that when we dissect a fractured bone in the first days, we find the periosteum thickened like soaked shammoy

leather, the soft parts massed together by inflammation, and the secretion of bone beginning in separate points; and when we dissect an old fracture, we find little pieces and splinters perfectly consolidated into the callus, which had been entirely separated from the bone. This case, then, requires nothing but ease and quiet, and a favourable posture of the part. The cure may be resembled to the adhesion of an open wound, where there is immediate re-union of vessels, no suppuration, no waste of parts, no remaining mark of injury, there is a spontaneous and perfect cure. The cure is spontaneous, the work of nature alone; the surgeon has nothing to care for but the form of the limb; to lay it even at first, and to redress its posture when it happens to be disordered.

Secondly, *Compound fracture* is that where the fracture is accompanied with an outward wound, and it is called Great Compound Fracture when the bone protrudes. And in this case the flesh is often cruelly mangled, and the bone shattered into many pieces, and yet the parts retain (though not always) their life and vigour. The protrusion of the bone makes a rude and lacerated cut; the soft parts, as the periosteum, muscles and skin, are all cruelly mangled, but they are not destroyed; the periosteum still clings to the bone, the muscles to the periosteum, and the skin to the muscles; there is a very shocking outward injury, but there is happily no proportionate disorder of the inward parts. The inward parts are lacerated and wounded by the protruding bone; they are hurt by the violence (as the crushing of a chariot wheel) which caused that protrusion; but they are still alive, still adhere to each other, and give mutual support; no part is so entirely killed, as by its death to draw on the death of the whole. But then these parts, though not killed, nor separated from each other, are so torn that they seldom re-unite; they run into inflammation, and the cellular substance is so filled with extravasated fluids, and the bones so crushed, and re-unite with so much difficulty, that the suppuration is very profuse.

The case, then, which is here defined, is a compound of fracture, with a great suppurating wound, not void of danger. The gorged vessels are soon unloaded by a free and timely suppuration: after the first swelling subsides, the parts become flaccid, the matter profuse, the patient is in danger of being exhausted with pain and fever, and the dangers of the case are chiefly those of a great suppurating wound. If we are forced at any time to amputate such a limb, it is only for want of strength in the patient to support the pain, fever, and profuse discharge; for through time and care the lax swelling subsides; the suppuration lessens in quantity; the loose bones are dis-



charged: the living bones (whose periosteum still adheres to them) though broken in a way seemingly destructive of all organization, recover their connexion with the fractured bone, in a manner which has long been admired. Of the bruised parts, those which lie deep come to be pressed into contact with each other; the vacant spaces within, and the external wound, are filled with granulations, and then the continuity of vessels is restored, and the callus is completed. This continuity of the vessels is essential to the regeneration of the bone; and we see the reason of a phenomenon which has excited the surprise, not only of Dr. Hunter, but all surgical writers from time immemorial, viz. that during the suppuration, and while the wound continues open, no callus, or at least no complete callus, ever forms.

Thirdly, In COMPOUND FRACTURE AND LUXATION, where, along with the protrusion of the bones, there is a laceration of ligaments, tendons, and capsule of some great joint, the case is peculiarly dangerous. When, for example, the ankle-joint is burst up, the astragalus broken to pieces, or turned out through the wound, the lower end of the tibia shattered and protruded, and the fibula also broken, the disorder is such as to defy the powers of nature, and art can do but little. This is of all cases the most perplexing to the judgment, and distressing to the feelings of the surgeon, who often wavers in fear and anxiety, for some days desirous of saving the limb, and yet fearful of losing the patient's life, till at last the fatal gangrene appears, and he feels most poignantly the fault he has committed, if, indeed, the surgeon can be said to have committed a fault, who has attempted to save a man's limb, though at the risk of his life. Yet the surgeon, though he have acted deliberately, conscientiously, sensibly and humanely; though he has been supported by the countenance of his fellow-surgeons; still, when misfortune comes, must feel himself unhappy.

The French surgeons, with one accord, declared amputation to be, in such cases, the only chance of saving the life. Palfin says, "In luxations of the ankle, there is seldom any thing to be done but amputation." The same is laid down by Duverney, as an express unconditional rule of practice. We do not comply with any such barbarous rule; we take it only as a denunciation of the danger which is observed to attend this particular case; we keep our minds free and unbiassed, so that we may be able to decide this question according to the circumstances. We know that nature will do wonders, but they are wonders, and we never enter upon the attempt of preserving a limb thus desperately fractured, without awful hesitation, and when we do venture to dilate the wound, and push back the bones, we feel all the responsibility of what we have just done.



We watch the appearance of mortification for some days, and wait with inexpressible anxiety the natural issue of the case, life or death.\*

Thus the simple fracture terminates in adhesion of the parts inwardly bruised and injured; compound fracture ends sometimes in adhesion, but more frequently in suppuration of parts too much bruised to adhere; but the fracture of a great joint, as of the ankle, is attended with lacerations too terrible to adhere, or even to suppurate easily; this is the case which, while it sometimes suppurates, is most apt to terminate in gangrene and death.

Fourthly, *Gunshot fracture* has many dangers peculiar to itself; and of all those circumstances by which, in other fractures, the soft parts recover their healthy condition, and the splinters regain their natural connexion with the bone, not one can take place in gunshot-wound: for here there is infinite loss of substance; the bone is not merely broken, it is destroyed, contused, and deadened by the blow, and condemned to the absolute exfoliation of every individual particle and splinter that has been shaken by the ball.

From the moment in which the bone is struck by a ball, it loses its life and circulation, and all its connexions with the soft parts. The bone is deadened to some extent by the force of the blow; it is splintered into many pieces; the periosteum too is killed by the shot, so that, of the injured or splintered pieces, not one can recover its life, or resume its connexion with the living system.

Nor is the bone only killed, but all the surrounding parts also; for the bone is the resisting body which, by receiving the force of the ball, reverberates it upon the adjacent parts; so that that portion of the flesh which most immediately surrounds the bone, is particularly affected, is deadened, and thrown out in the form of sloughs.

These are the accidents of this species of fracture, which distinguish it from all others; for the death of all the internal parts insulates the broken bone. There can be no adhesion among parts which are actually dead; the continuity of contused vessels can in no shape be restored: instead of a knotting of the soft parts into a vascular mass, full of life and action, supported by a continuity of vessels, and fitted for the generation of callus, there is a cavity full of fœtid matter, dead and sloughing flesh,

\* I would recommend, in every case of compound luxation and fracture of the ankle-joint, to endeavour to save the limb, not only because many have been preserved, but because I believe the patient is more apt to die where the leg is taken off from gangrene, than he is from symptomatic fever and mortification, where it is suffered to remain. When suppuration is once completely established, the extremity may then be removed with perfect safety, should it be necessary. S.

and insulated fragments of bone ; a narrow opening, a deep and ill-conditioned wound, and a profusion of foul and putrid ichor flowing from the narrow openings, or bursting through various fistulas from time to time.

Thus a gunshot-wound, with a great fracture, resembles in many points the worst kind of caries. The detached bones are discharged with difficulty ; the dead parts which have sloughed off, are very slowly replaced ; it is long before the wound begins to heal from the bottom, or, in other terms, before the continuity of vessels is restored, or the mass of vascular substance prepared, in which the callus is to be formed. In short, the parts are with difficulty regenerated ; they are slow to heal ; apt to run into ulcers, fistulas, and collections of matter ; while the patient is exhausted by pain, fever, and profuse discharge.

Having thus explained to you the general nature of a gunshot-fracture, I believe you can be at no loss to imagine the peculiar difficulties of each case ; for where the limb that is wounded is small, there is less destruction of parts ; the sloughing is not great, the suppuration is slight, and the bones being near the surface, the shattered fragments are easily discharged. Thus it is in wounds of the radius and ulna, and of the os humeri.

But where the bone is greater, the mass of soft parts more bulky, the wound of course deep, and the destruction of parts proportionably great, the matter is apt to insinuate itself among the muscles, to insulate the bones, and to make, in the end, crooked and fistulous passages, and an almost incurable sore. Such are often the consequences when the bones of the leg are broken, especially where the joints of the ankle or knee are concerned.

But where the bone is the largest in the body, and covered with a great thickness of flesh, as in the thigh, there is a very extensive destruction of parts, the mass of disease is very great, and if the patient escape gangrene in the first days of the wound, he generally perishes afterwards from the fever, the incessant suffering, and profuse discharge. From a gunshot-wound in the haunch-bone, or in the femur, near its neck, about the trochanters, or any where high in the bone, not one of twenty escapes. The sufferings of such a person may be easily imagined, since he lives, or rather, one might say, continues dying for five years, and while he lies on this bed of torture, with matter running in profusion from various fistulas every where surrounding the joint, irregular callus shoots out in fantastic forms round the bone, so as to unite the bones in that crooked form in which he lies ; yet, even while the callus is thus forming, the fistulas being incurable, and the discharge profuse, amputation is impossible, and the patient expires.

## DISCOURSE XI.

RULES FOR THE MANAGEMENT OF SIMPLE,  
COMPOUND AND GUN-SHOT FRACTURES.

**SYSTEM-WRITERS** still retain the old descriptions and terms of art, of which there is not one that does not imply an absurdity. Of these the most conspicuous are, *EXTENSION*, *COUNTER-EXTENSION*, *COAPTATION* and *DILIGATION*. These terms were descriptive of operations which were actually performed by the glossocomas of the ancients, and by the block and tackle of the modern surgeons.

*Extension* was the fixing of lacs and bandages upon the lower part of the fractured limb, to which were applied ropes and pulleys, by which the assistants pulled. *Counter-extension* was the resistance which other assistants made by tablecloths, girths and bandages, put round the pelvis and upper part of the thigh. *Coaptation* was the thumbing and working the smaller fragments and the broken ends of the bone into nice contact with each other; but *diligation* was a process which it would take hours to describe, as it took hours to perform! of compresses applied round the broken ends of the bone, pads and cushions laid along the sides of the limb, splints above these compresses and cushions, with distinct rollers for each several stage of the operation.

But I will describe the real operation in plain words, in which there is no occasion for any such terms as extension, counter-extension, diligation, rope, pulley, compress or bandage! That is indeed rampant surgery! Were it possible for a limb to require such extension, it never could be maintained. When a limb, the leg, for example, is broken, you need no nice and critical diagnostic signs to distinguish the fracture by; the broken limb yields under the weight of the body, the patient hears and feels the snapping of the bone at first, and is sensible, when the limb is moved, of that grating of the broken ends of the bone against each other, which was in the old vocabulary termed *Crepitation*; and the surgeon, when he begins to handle the limb.



is sensible of the same grating, he perceives by the bending of the limb that it is broken, and there is indeed so little difficulty in distinguishing a fracture, that I have never seen a patient who was not sensible of his condition, nor heard of a surgeon setting a sound limb, *except by design*. In setting this broken limb, there is no extension required but such as common sense would direct you to use if you were not a surgeon. You lay the patient in bed, and lay the limb on a pillow, or if you design to use splints, you have two long troughs or pieces of pasteboard bent into a hollow form, lined, or rather cushioned, with two or three plies of flannel, and with tapes or ribbands, four or five in number, attached to the outside of one of the splints, by which both splints may, after all is over, be gently tied together with bow-knots, to be slackened or tightened according to the swelling of the limb; you also soak and soften the pasteboard a little, that it may take a shape suitable to that of the limb.

A long splint of this kind being laid flat upon the bed by the side of the fractured leg, you desire one of your assistants to apply his hands broad round the upper part of the limb, and grasp it gently and steadily; you take the foot and ankle in the same manner in your own hand; you slip, perhaps, your left hand under the broken part of the limb, and thus you and your assistant carrying, or rather sliding the limb gently along, lay it upon its pillow (which should not be a common one, but rather like a mattress or settee pillow flat and firm), or upon its splint.

Then you begin to lay the limb smooth; your assistant grasps it again by spreading his hands upon the thigh or below the knee, with the design of extending along with you, not by lifting the leg from the pillow, but rather by spreading his hands over it, pressing it down to the splint or pillow, and steadying and holding it by the pressure, while you, with both hands, lift the foot and ankle, grasp them gently but very firmly, raise them a very little from the pillow or splint, and draw gently, steadily, and smoothly, and when you have extended and smoothed the broken leg in a manner which you almost suppose agreeable rather than painful to the patient, you press it down upon the splint, you and your assistant both keeping the limb steadily and gently pressed down. You keep it flat and pressed with all your hands till it gets a sort of seat and bed in the pillow; or if splints are to be applied, the limb is now pressed against the lower splint; the upper splint is then laid above it by a third assistant; you now grasp the limb with your hands on the outside of the soft and moistened splints; you grasp and model them a little, and when the whole has taken a form, you tie the several tapes one after another, and after having tied them in a general way, you go over them again one by one a second



time, and tie them a little closer, so as to keep the limb agreeably firm.

There is in this description, you perceive, no mention of those high-sounding terms which were so peculiarly descriptive of the grand surgery of the old masters; if we must retain them in our modern nomenclature, there should be associated with them no ideas of lacs, and pulleys, and assistants pulling at a fractured limb. Extension means, the surgeon gently drawing out the fractured member; counter-extension means no more than some friend or assistant holding it firm above; coaptation means only the smoothing of the limb and grasping the fractured parts in the hands, and pressing it so down upon its pillow or splint as to give it a sort of seat; while the diligation is a thing to be quite forgotten. There is much virtue in a word; many a lameness, and not a few gangrenes, may be imputed to this term diligation.\*

Yet these directions, though plain, simple, and manifestly consistent with common sense and the best principles of pathology, will give you little confidence unless you be satisfied that they can be safely applied to each individual case, and that no other rules can be applied with good effect.

## SECTION I.

### *Rules for the setting of Simple Fractures.*

It is manifest that a fractured limb needs only to be laid even and moderately steady, to be perfectly reunited without our help; but if a person were drunk, delirious, or maniacal, it would need to be bandaged: for the same reason, if a fractured bone be in danger of being moved by the unavoidable motions of the body, or by the natural functions, as respiration, it surely must be bandaged.

1st, *In fracture of the HUMERUS or ARM BONE*, the patient is not to be confined, he is not to lose his health on account of this trivial accident; and since he is to walk about, the motions of the body and swinging of the arm would necessarily discompose the bones, and absolutely prevent their reunion. The fracture of the arm-bone then is to be set with two small flat splints of pasteboard, lined with flannel and rolled with a roller

\* I here am careful to describe the common operation, and that only: there are certain cases afterwards to be mentioned, especially of compound fracture, with protrusion of the bone, where a more powerful extension is necessary, but still neither pulleys nor ligatures are used, only, the surgeon sometimes twists a hand towel round the ankle to give him a steadier hold.

gently, but not carelessly applied, because the common splints merely tied with tapes would slip off, and because the arm hangs naturally away from the body, so that it is easily rolled.

N. B. When the fracture is near the lower end of the humerus, near the condyles, or in what is improperly called the neck, viz. near the head of the bone, it is apt to be more oblique, and then firmer splints, a steadier bandage, and more careful posture of the arm are necessary; and when it happens that the shaft of the humerus is separated from its head, the axilla should be filled with a compress to keep the bone out and in its right direction.

2d, *When the FORE ARM is fractured*, although one bone only be broken, it is easily distinguished, because the slightest turning of the hand produces rotation of the RADIUS, and consequent crepitation, the radius being fractured; whereas, when the ULNA alone is fractured, the change of shape is almost as great as if both bones were broken. When one bone is broken, the arm manifestly cannot be shortened, and even when both bones are broken, the general surface formed by the two bones and their interosseous membrane is so broad, that they are fairly opposed to each other, and soon reunite. The fracture of the fore arm requires two flat splints which are to be laid one on the inside, the other on the outside of the arm, and in place of rolling the fore arm with a roller, I usually tie the splints with three or four broad tapes or ribbands, each about a foot in length, not connected with the splints, but laid upon the table under the lower splint when the arm is about to be laid upon it.

N. B. In the fore arm I have remarked two things, first, That the hand must not be turned in any degree, i. e. it must neither be in what anatomists call a state of pronation, nor a state of supination, but the thumb even with the line of the Radius, and the little finger with that of the Ulna; and to preserve it in that position, the splint that lies on the inside of the arm must be long enough to reach to the palm of the hand, so as to keep the wrist steady, and prevent rolling of the radius; and this splint, where it is lodged in the palm of the hand, must be a little padded and a little bent, so as to let the fingers bend easily over it.

Observe also, that the representation I have given of the adhesion and massing of parts about a fractured bone, is so far true, that the callus is formed, not by the particular ends of each individual bone, but by the whole mass of bone, inflamed periosteum, and cellular substance; whence it often happens, especially in compound fractures, where the mass of parts engaged in the process is great, or in gun-shot fractures, where the arm, from the tediousness of the sore lies very long extended upon its splint, that the ends of the bones are united in one mass of

callus, by which the motion of the radius is hindered, and of course the turning motion of the hand is lost. This produces a more awkward and distressing kind of lameness than you would easily imagine, the patient cannot carry any thing to his mouth without turning the arm at the shoulder, the effect is the same precisely with that of an ankylosis of the elbow joint. I saw several examples of this at Yarmouth in the Dutch hospital, where men shot through the fore arm had been permitted to remain in their cradles all the time of the cure, their arms lying all the while flat and unmoved, till at last they became immovable.

3d, *In fracture of the CLAVICLE, or COLLAR-BONE\**, the weight of the arm pulls down the scapula, for in fact the clavicle is the only connexion the scapula has with the trunk; the scapula itself only glides upon the ribs, without being connected with them, large muscles lie betwixt the lower flat surface of the scapula and the thorax. The accident is easily distinguished, as the bone can be felt in its whole length; perhaps there never was a patient sober enough to know any thing of his own situation, who was not conscious of the nature of the accident that had befallen him when the collar-bone was broken.

This particular fracture is both reduced and retained, by first pulling both shoulders strongly backwards, and then turning a firm linen roller round the shoulders, crossing upon the back, so as to leave the place of the breast where the fracture is, exposed and open; for this no more requires splints nor compress than any other fractures, it is only in consequence of the weight of the arm that the fractured clavicle requires firm bandaging.

N. B. This particular fracture is rarely accompanied with a wound, nor is there any difficulty in reducing or retaining the clavicle in its right place; but sometimes it may be useful to fill the axilla with a large compress, in order to support the shoulder and to keep it off from the thorax, so as to extend (if we may use such an expression) the broken clavicle to its full length. When the arm is big and heavy, when the patient has to complete his journey in a carriage, &c. it is proper to add to the figure of 8 bandage round the shoulders, another bandage supporting the fore arm and confining it close to the body. This second bandage is indeed necessary in every case, to prevent the swinging of the arm and the unavoidable rolling of the collar-bone.

In respect of the fracture of the acromion process of the scapula, it may be sufficient just to remark, that it also is known by a falling forwards of the shoulder, and the place of the fracture is easily distinguished as the bone is superficial. This fracture requires chiefly that the shoulder should be pushed upwards, by

\* See what is said on this subject, in chapter on Bandages, page 41. S.



which the head of the shoulder-bone, pressed upwards against the fractured process of the scapula, raises it to its right place. In this fracture, the shoulder must be firmly bound, and the fore-arm particularly well supported.\*

4th. *In fracture of the sternum*, the broken bone is moved, not by the motion of the trunk or body, but by respiration: at every motion of the thorax, the patient is sensible of the grating or crepitation of the bones; the surgeon feels it with his hand, and hears it by approaching his ear to the breast. The motion of the broken sternum soon inflames the mediastinum under it, and by degrees the inflammation extends along the pleura and whole of the thorax. There comes on a frequent cough, and during every paroxysm of coughing, the crushing of the fractured sternum is dreadful.

This fracture admits neither compress nor splints, and yet it must be kept perfectly steady; to do this, nothing is required but a simple swathe or bandage round the chest, but it must be so firm as to prevent the respiration being in any degree performed by the motion of the thorax; the motions of the thorax must be entirely suppressed by the bandage, and respiration performed by the diaphragm alone.

*N. B.* In this fracture, the motions of the thorax being incessant, the re-union of the fracture, without bandage, is impossible: if you fail to apply the bandage, the motion of the bones will raise the inflammation to that height, that the patient will be suffocated by the general affection of the lungs, or by the effusion of matter round the broken bone; and the least misfortune that can happen, is tedious suppurations under and around the broken parts of the sternum, and caries of the bone itself, so that it becomes necessary sometimes to apply the trepan. The bandage which we have directed, though drawn very firm, is far from oppressive, the patient feels it to be rather a relief; before the bandage is applied, the grating of the bones, the inflammation, high breathing, and terrible cough, are increasing every moment; but no sooner is the bandage drawn firm, than the crepitation ceases, the pain is relieved, the cough and high breathing, begin to abate; and by plentiful bleedings and opiates, all comes right again, and the patient is saved.

5th. *Fractures of the ribs* are like those of the limbs, simple or compound, with or without injury of the surrounding flesh; and when there is injury of the adjacent parts, it is by the ribs

\* There is an accident to which the shoulder-joint is liable, which Mr. Bell has not noticed; that is, a fracture of the cervix scapulæ. This fracture may be always ascertained by pressing with the finger upon the coracoid process, and rotating the arm, when the crepitus may be felt. The treatment is simple; the arm must be supported and bound to the body, so as to prevent its motion. S.



being driven inwards, so as to wound the lungs without any outward wound, such as make the inflammation dangerous.

If the fracture be simple, of one or more ribs, it is distinguished, and hardly distinguished, by a slight crepitation, the broken ribs being wrought backwards and forwards under the fingers, by the patient being sensible of the grating of the broken bones, and by the sharpness of the pain. There is little crepitation, because the ribs are so connected with each other by the intercostal ligaments and muscles, that they cannot be displaced; each rib serves as a splint to preserve the direction of the adjoining ribs. There is no occasion for setting the broken rib for any compress, nor for any particular bandage; but to prevent motion, the heavings of the thorax are to be suppressed by applying a table-napkin firmly round the breast, as in figure 14, which, the firmer it is applied, gives the more perfect relief. This is all that is usually done; labourers and country men, with whom the accident is frequent, do no more, and seldom require advice.

When the rib has punctured the lungs, the air is effused, an emphysematous tumour is formed, crackling like a bladder half full of air. There is no possibility of mistaking the nature of the accident: it may in general be disregarded, for inflammation round the broken bone soon closes the opening in the thorax, inflammation in the wounded part of the lungs prevents the farther effusion of air, the air already effused is absorbed, and the tumour disappears. But if the effusion of air continue, the whole body will be inflated, the air passing along in the cellular substance will inflate the scalp and eyes, and extend downwards to the thighs and private parts, till, by its accumulation about the throat, it almost suffocates the patient. Small scarifications with the point of a bleeding-lancet, are required to discharge the air, through which it must be pressed; they may be made occasionally in various parts; they heal immediately. After the cellular substance is emptied of the air, the point where the broken rib is, should be pressed with a firm compress, to assist the adhesion of the lacerated parts surrounding the fracture.

6th. *In fractures of the spine*, there is nothing that belongs to the surgeon's department; the spinal marrow is affected by the compression of the fractured bones, or injured by the concussion, just as the brain is affected by a blow on the head; but it is a kind of injury much less accessible to the surgeon's hand. The spinal marrow is plainly compressed, the patient loses instantly the power of his lower extremities, which are cold, and without feeling, the bladder and rectum are paralytic; the surgeon needs to order glysters daily, and to introduce the cathe-

ter. The parts on which the patient lies ulcerate first, and then, in spite of all possible care, fall into gangrene. Such are the symptoms, and such frequently the manner of our patient's death; and notwithstanding the bloody operations described in books, of making incisions, finding the fractured or luxated bone, and drawing it out by the spines or splinters, there is nothing practicable; and those very ignorant directions, given upon the highest authorities, are dangerous to none but boys. The cutting into the fractured vertebra is a dream.

7th. *In fractures of the lower extremities*, there is no occasion for bandages;\* for the patient lying in bed, the part is in no danger of being moved. Unless you could invent a machine, which could enable a patient to walk or stand upon his leg, you need none. In all fractures of the leg, then, simple as well as compound, you merely lay the limb out upon its pillow or splint; nothing but convulsions, delirium, or mania, can endanger the fracture, or require bandaging. In laying a fractured leg, where but one bone is broken, you need be at no pains about the posture; if the leg lie easy, and the patient complain of no pain, all must be right; but when both bones are broken, you must be at pains to trace the sharp line of the tibia with your finger; for that regulates the posture of the leg. This you cannot do at first, because the general swelling hides the bone, but you have no fear of altering the posture of the limb, and you know that the subsiding of the swelling marks the proper period for ascertaining the posture of the limb.

*N. B.* In fracture of the leg, and especially in compound fracture, you must be careful to preserve the right posture; for the limb is exceedingly apt to change its form from day to day, according to the place that the patient takes in his bed, and the posture of the limb with regard to that of the body. Two points you will especially attend to; first, The heel slipping over the end or side of the pillow, or, making by its prominence more impression upon the bed or pillow, falls downwards; and when the bones are re-united, it is found that there is a slight deviation of the tibia from the straight line; the bone appears a little prominent on the inside of the leg, while the foot is a little turned outwards, in a lame, or at least a weakly posture; yet this degree of obliquity, though it causes a slight awkwardness, never causes a great deformity. Secondly, The strong muscles lying all on the back part of the leg, the fractured part is more apt to be bent in the opposite direction, so that the bones

\* Notwithstanding what is here said, I would recommend a many-tailed bandage over the limb, which may be kept wet the first few days with a solution of acetate of lead. Tapes ought to be passed under the pillows, and tied with moderate firmness over the leg, to prevent involuntary starts and other accidents. S.

unite with an angle at the shin. This causes a grievous deformity, and worse than that, produces a shortening of the limb, and a halt in the gait, almost as remarkable as that which arises from fracture of the neck of the thigh-bone, and the point or angle where the tibia projects, is apt to become a sore, for it is very easily fretted and ulcerated. This is especially to be guarded against, and is particularly apt to happen in compound fracture, where the limb, being laid in a great case, is plastered and poulticed, so that the surgeon hardly allows himself to see how the bones lie, and has given such a formidable appearance to the disordered limb, that he is afraid to look at his own work, or to move the leg. Two directions then may be useful: first, Always to pad up the heel and foot properly, so as not to allow the heel to sink, or the foot to fall to one side. Secondly, To be careful always to prevent the leg taking an arched form, with an angle at the middle of the tibia; it is impossible to keep the foot too far forwards, or, in other words, an angle in which the middle of the tibia was depressed, was never known to happen.\*

8th. *But in fracture of the thigh*, there is no possibility of having any relief, but by that slight change of posture which can be accomplished by moving the body, while the thigh itself is kept as steady as possible upon its pillow.

First, *When the neck of the thigh-bone is broken near its trochanter*, you would not leave the cure entirely to Nature; you would not willingly believe that you can do absolutely nothing for your patient or friend. When you extend the limb, and find that you have so far replaced the broken bone, that you begin to feel the crepitation, you cannot but wish to retain it in that place, and you lay large and firm compresses upon the trochanter, the rising of which marks the shortening of the limb, and the fixing of which would prevent that shortening. These compresses should be pressed very firm by a spica bandage rolled round the hip, as it is in page 41 round the shoulder. A long splint must next be prepared, of sufficient length to reach some way up the side, made of firm deal board, declining gradually in size, in proportion as the member naturally diminishes in size, covered well with flannel, that the patient may feel no hardness. There must be put round the pelvis a very firm bandage like the topband of a pair of buckskin-

\* Whether splints ought to be applied in the first instance, or not, to a fractured leg, there can be no doubt of the necessity of using them when the inflammation has subsided. Martin's whalebone-splints are the best, though the common wooden ones will answer. They should be applied with sufficient firmness, to prevent all danger of the fractured bones being deranged by any ordinary accident; the roller will require re-applying about twice a-week, during the progress of the cure; at each time of doing this, the surgeon should ascertain that the bones are in their proper position. S.



breeches; and into a slit in this bandage must be fitted the top of the splint. The resistance which is to elongate the limb, is to be accomplished by the pressure of the top of the splint against this circular, and therefore the circular must be prevented from being pushed upwards by a strap going round under the pelvis, like that of T bandage; or why should we not actually take the top-band of a pair of buckskin-breeches, keeping also a part of the thigh of the breeches to make the pressure more general, with a pocket something like the fob or side-pocket inverted, to slip the top of the splint into, as an ensign lodges the colour-staff in his side-pocket? I need not relate to you how, after the chief resistance is established, the limb may be extended and secured by lacs round the knee and ankle; as to the permanent extension, if you will attempt it, it must be easier with the assistance of this splint: after fixing your lacs or bandages round the ankle, you may bring one of them round the lower end or point of the splint, and extend it occasionally, without any ill-looking apparatus, any apparent cruelty, or real violence.\*

Secondly, *When the fracture, in place of being in the neck, is below the trochanters in the shaft of the bone*, where fewer muscles are implanted, the retraction is less powerful, but still there is retraction, and the shortening of the limb must be resisted by the long splint of Duverney alone; it is not a torturing machine; does not grasp the limb at particular points, but lodges the whole limb, and gives friction and resistance at every point.

Thirdly, *When the thigh-bone is fractured in the middle*, there is no reason, even in the most muscular man, to fear retraction, and the thigh may, with all possible propriety and safety, be laid smoothly out upon a pillow, being careful of the posture of the body, that it be not higher than the thigh, so as to gravitate downwards upon it; the thigh should be laid on one side; should be laid a little out from the body, and a little higher, (indeed the body naturally sinks into the bed) and the surgeon should also be careful of the posture of the heel and foot; for the leg is apt, by its weight and wrong inclination, to turn the thigh upon its axis.

Fourthly, *In fracture of the very lowest part of the thigh-bone, in the part adjoining to the condyles, or lower head of the bone*, the fracture is apt to be very oblique; and sometimes it happens that the bone is fractured so very obliquely, that the effect is the same as if one of the condyles only were broken away. In this oblique fracture there is indeed no forcible re-

\* Boyer's *sous-cuisse* might certainly be added with advantage to this apparatus, whether the surgeon attempted permanent extension or not; nor must he by any means omit keeping the thigh wet, as long as there is any danger of inflammation, with a solution of acetate of lead. S.



traction of the bone, but a continual tendency to obliquity. Very often I have seen such a fracture so ill cured, that there has been a shortening and weakness in consequence of the in-kneed posture of the limb, which was both very distressing, and a very great deformity. Then, although there is no occasion in this fracture for any powerful machine, there is a necessity for the perpetual resistance of a very strong splint. The leg turns outwards; the splint of firm fir board, &c. is therefore to be applied (with proper compresses to prevent pain) upon the inside of the knee-joint, and bound very firm with circulars above and below the knee. You cannot bend the leg too much inwards; it always inclines to turn out.

N. B. In fracture of the thigh-bone, we foresee a very uneasy confinement of six weeks to the most irksome postures, and the ease and comfort of our patient are principally to be studied. He should be laid on a hair mattress, which is cool and firm, rather than on a bed, in which he is apt to sink down; and it will be of infinite advantage to him to have a fine flat and thin hair mattress cut into four or six pieces, and the cut parts sewed again and covered with pieces of sheet; then first laying boards in place of the canvass across the frame of the bed, then laying an entire mattress for the bottom of the bed, and then laying the several pieces of the cut mattress according to your pleasure, you can raise or depress any part of the body to any degree, and alter your patient's posture with the least possible motion. If any other pillows be required, they should be the firm and flat hair-cushions, like those of a couch, and indeed the best bed is a couch, which friends and attendants can go round about in all directions, which can be wheeled to the window, or towards the fire, without discomposing the fracture, and which should be placed in some public room, where the patient will have as little as possible of the feelings of a sick bed.

You must have a hand-rope for the patient to raise and move himself by, without any strain of the limbs or body, urinals and bed-pans for his conveniency, and he must have occasionally anodynes to abate the irritation of his confinement and distressing posture, and laxatives of castor oil, cream of tartar, lenitive electuary, sulphur, or whatever suits his constitution, to prevent the constipation which proceeds from opiates and confinement.

9th. *In compound luxation of the tibia and fibula*, in that where the bones are broken, the joint burst up, the heads of the bones turned out through the wound; the astragalus and heads of the tibia, or of the fibula, almost separated, there is such destruction and laceration of parts, that we are doubtful whether to attempt preserving the foot; we can do little more than lay

the limb on the sound side, and keep the foot as nearly as possible in its natural and proper direction. I have sometimes seen the ankle-joint wonderfully distorted, from being fractured and dislocated, even without that laceration of the skin which constitutes the case of a compound fracture; and by drawing upon the foot very gradually, but powerfully, and working and modelling the disordered joint in the hand, I have restored it to its right shape, have set it with a firm splint well covered with flannel, &c. and bound pretty firm with a figure of 8 roller round the foot and ankle.

N. B. In this fracture still the tendency of the foot is to turn outwards, and you have to lay your splint along the inner side of the ankle-joint, making a small window or opening in your splint to receive the projection of the inner ankle. By the resistance of this splint you draw the foot, which is inclined to turn outwards in a splay-foot posture, inwards into a natural one. It is the process of the fibula that guards the ankle on the outside, and keeps the foot right; and it is the fracture of the fibula, and the yielding of the outer ankle, that makes the foot fall off towards that side.

I mention this luxation here, because it is the only luxation where the head of the bone being replaced does not remain; it is the only luxation that needs to be bandaged as a fracture.

10th. *In fracture of the patella*, the chief difficulty is to preserve the bones in perfect contact with each other, insomuch that Dr. Hunter, unable to account for the difficulty of accomplishing a perfect cure, imagined that the failing of the usual process in this particular instance, could be owing to nothing else than some part of the membranes surrounding the joint falling in betwixt the two bones, so as to prevent them coming into proper contact.

In this particular fracture the leg must be kept extended to the utmost; the upper piece of the fractured patella, which is retracted to a great distance above the knee, must be smoothed and thumbed downwards, and put in as close contact as possible with the lower fragments. To put it in close contact is the difficulty: it seems to be in close contact at the time of your operation, and you are only convinced that the pieces have not been in contact when the cure should be complete; for when the swelling has subsided, when the patient begins to walk, a hollow is seen betwixt the two ends of the bone, and a ligament of some length is felt uniting them. The patient losing the pulley-like projection of the patella or rotula (and the extensor muscle being shortened) is never able to stand on one leg, never able to bear up the body on that limb, never able to mount a stair without carrying that leg before, and is never out of

danger of forgetting himself, trusting the weight of the body upon that limb, falling backwards, and so breaking the other patella, or snapping the same one a second time, as I have seen happen very often.

To preserve the bones in absolute contact, and prevent this imperfection in the cure, is almost impossible. The swelling, before you are called, is so great, that in many cases bandage cannot be applied for six or eight days. When the swelling is gone, the pieces of the bone cannot be made to approach each other, nor can the bandage, from the remains of the general puffy swelling, be applied close to the bones. The bandaging has been attempted in various ways. The common bandage is a belt of leather split like the common leather retractors, with a small opening in the middle of the slit, for receiving the patella; each of the sides or semicircles of this opening is padded up with leather, so as to make a pretty firm compress of a circular form; and when the bandage is buckled round the knee, and drawn firm, the two sides of the slit are of course drawn so close together, as to press the two pieces of the patella betwixt them.\*

N. B. Before applying these rollers, they should be all soaked and wetted (best in spirits) to make them stick closer to the flesh, and if (having applied them) you are perfectly satisfied with their operation, you may easily convert them into a firm case, by taking a glue-pot and soaking them with glue, so that each turn of your roller would stick to another, and the whole to the flesh, the knee being thus enclosed in a very perfect case. Both during the cure and for some time after the patient begins to walk about, I find it convenient and safe to stiffen the joint, by laying a strong splint behind the ham, lest the patient should make a false step, and the knee yield before the ligament joining the bones were become strong.

N. B. Though I prefer simple and moist rollers, which stick thus close to the parts, yet there is no doubt that the clumsy compress-like roller contorted round the knee in the form of figure of 8, has sometimes succeeded remarkably well. In proof of this, remember what Meibomius reports of a cow-herd, who having broken his knee pan, made a very perfect cure by twisting round it a firm straw-rope.

11th, *In fracture of the Olecranon* (which is another exception to the general rule of keeping a fractured limb gently and

\* A similar roller passed firmly from one extremity of the thigh to the other, so as to prevent the contraction of the extensor muscles of the leg, will be of great service. I have, within this day or two, seen a person whose right patella has been broken, and is re-united by a ligament, who says that leg is as strong as the other. The space between the fractured portions is about half an inch. S.



pleasantly bent), you must keep the arm completely extended\*, for the triceps muscle pulls up the olecranon to an incredible degree, it mounts absolutely half way up the arm, and although you thumb it down again, yet if you keep the fore arm in any degree bent, the interstice betwixt the end of the ulna and its broken process will be filled up with bone, and the fore arm be so far ankylosed, that the patient will never be able to extend it, for this filling up of the interstice will be just equivalent to the lengthening of the ulna.

In setting this fracture, you force down the retracted olecranon, which is broken away from the end of the ulna, and you completely extend the fore arm so as to make the end of the ulna meet its broken process, you cover the broken process with a compress, and fix it with a double-headed roller, turned in form of figure of 8 (as in bleeding), making occasionally turns purely circular round the broken part, and you make all sure by laying a stiff splint in the bend of the arm, and fixing it with a second roller in order to prevent the arm being thoughtlessly bended; indeed, nothing in such cases should be trusted to the discretion of the patient.

N. B. In this fracture there is abundance of callus: there is no danger of that imperfect and ligamentous union which takes place in the broken patella, nor is there any danger of that profusion of callus, running like molten lead, into the cavity of the elbow joint, which was supposed to happen, and to occasion ankylosis. When this fracture has been neglected or ill set, the fore arm kept at right angles with the arm, and the person lamed perhaps in his right arm, it has been proposed to make incision to cut out the intermediate callus, with the design of setting the bones properly with the arm extended; an operation which is surely not impracticable.

12th, *The rupture of the Tendo-Achillis, or great back tendon of the leg*, more justly ranks with fractures than with lacerations; for while it was considered as a laceration of a soft part, it was actually the practice of surgeons to sew the ends of the tendon together with great embowelling needles; but now being ranked with fractures of the bones, it is set like a broken bone, like the fracture of the patella, for example, and the surgeon has no care but merely to smooth down the muscle, to prevent the retraction of the tendon, to preserve the ruptured parts as nearly as possible in contact with each other.

\* It is necessary in this accident to use great care to prevent the joint from becoming stiff from want of use. In the first place the fore-arm ought not to be extended farther than is necessary to allow the fractured ends to be placed in contact. 2dly, Moderate flexion and extension ought to be used as early as the third week, and repeated every day or two to as great an extent as can be safely done. S.



The tendo-achillis is broken as the patella is, not by a blow or fall, but by a sudden and violent exertion of its own muscles, in consequence of making a false step, the patient being instinctively incited to make an exertion too sudden and violent for the tendon to withstand it; an exertion which sometimes, in place of tearing the tendon, breaks the heel bone. When the tendon is broken, the patient, from its insensibility, feels no pain, he feels as if he had been struck a smart blow with a stick; it commonly happens, in dancing, or in making a false step, as in slipping, though not unfrequently it happens when walking apparently securely on even ground; the patient instantly falls down lame, the shortening of the bellies of the gastrocnemii muscles, the retraction of the tendon, and the interstice between the two ends of it are perceptible, and the patient himself is conscious he has broken the tendon.

For setting this ruptured tendon, various machines have been invented, and especially various shoes with straps and buckles behind to draw up the heel, while the upper part of the tendon, on the other hand, is pressed downwards. According to my experience, this extension of the toe and drawing up of the heel are unnecessary\*; the foot may be safely left in its natural posture; it is chiefly important to prevent the slightest contraction of the gastrocnemii muscles; for this purpose, the calf of the leg should be smoothed downwards with the hands, the whole of the calf of the leg from the ham downwards must be rolled with a firm roller, proceeding from above, but the bandage should not pass the biggest part of the calf, nor at all approach the ruptured part, nor even the inflammation and swelling which surrounds it.

N. B. The chief danger in rolling the leg in rupture of the Tendo-Achillis, consists in approaching the part actually fractured. I was once called to a gentleman whose whole leg from ham to heel was firmly bandaged with a roller, the turns of which made deep impressions on the swelled ankle; and at the point where the tendon was actually ruptured, the turns of the roller (so firmly was it drawn) had sunk down very deep indeed betwixt the ends of the tendon, they were thus separated to a great distance from each other, there was no possibility of their uniting, and had they been left so, the old gentleman must have continued perfectly lame. It was on the fourth day after the accident that I was called and undid this bandage, yet the cure was in the end tolerably perfect. The muscle should be well rubbed and smoothed down, and neatly rolled, the ankle and cellular substance surrounding the ruptured part should be left per-

\* The extension of the foot may be of service, and can do no injury. S.

fectly free, the foot should be steadied, but kept quite on the level, the toe neither pointed downwards nor upwards, but the foot kept at right angles with the leg. Mr. Robbard, surgeon (I believe) at Ipswich, was so bold and so honest, as to make the experiment first on his own person, of just tying down the gastrocnemii firmly, but still continuing to walk about all the while the tendon was reuniting. This I dare no more approve of than the firm bandaging of the ruptured parts.

The tendon is generally a little knotty, especially when first united; sometimes it adheres so to the surrounding parts, as to make the joint stiff; and always the tendon is a little lengthened, and the muscles of the calf somewhat contracted, so that the calf of the leg seems to have shrunk upwards towards the ham.

## SECTION II.

### *Conclusion.*

In this section, consisting altogether of rules, which should be perfectly minute, I fear there must be many omissions which I shall hardly be able to compensate for in the following general observations.

First, It is uncomfortable for the young surgeon not to know at what period he may venture to undo the apparatus in any particular fracture; for this reason, though there can be no specific nor absolute rule, yet surgeons have been at pains to mark the period in which they suppose each individual fracture to be healed. Without warranting the propriety of these rules, allow me to mention, that authors say, the smaller bones, as the Clavicle, the Ribs, the Fibula, are cureable in twenty days; the bones of the Cubitus or Fore Arm, the Radius or Ulna, are cureable in thirty days; the fractures of the humerus or Thigh Bone require fifty days to reunite; though, to be perfectly reunited and strong, the fractured Thigh Bone requires seventy days. But rules so specific as these, mentioning the very day on which a fracture may be supposed to be cured, cannot be useful without being understood. Allow me then to observe, that as it appears to me the process is either slower and more imperfect in children, or at least, in children the bone is more apt to be broken again, we cannot indeed wonder at callus being slowly formed, since the bones themselves are still incomplete and growing for two-and-twenty years: in fractures then happening in children, you keep the roller and pasteboard splint longer applied. Nor is it from the slow formation of callus that the cure is delayed in fractures of the great bones; the

process is not slow in proportion to the greater mass of bone that is to be formed, perhaps a callus will form as rapidly round the bone of an ox as round that of a boy, and be as speedily completed in fracture of the thigh bone, as in fracture of the radius, for every part has vessels proportioned to the mass of callus that is to be formed; but the cure is slow in proportion to the size of the bone, from the larger bone having to support a greater weight; or rather the mass of callus is slow in acquiring firmness proportioned to its size, or to the weight it has to bear. It is for this reason that we are cautious of trusting the weight of the body too early on a broken limb; in fracture of the humerus, as the arm hangs and does not necessarily carry any weight, the patient may leave off his splints in six weeks; but in fracture of the thigh bone, which has to bear the whole weight of the body, we dare not expose the unconfirmed callus under such pressure, till fully three months have elapsed.

Allow me also to observe, that on particular occasions, particular precautions must be taken; that while a man is in his sound health and reason, no bandage nor splint is required in fractures of the lower extremity; but that when a man is maniacal or delirious, besides the ordinary precautions of splints, the limb, after being set, must be laid betwixt two pillows, tied to them, and the pillows in their turn fastened to the bed; that when a man has to be carried far with a fractured limb, besides being regularly bandaged with splints, there should be laid along the sides of the limb, above the splints, long and firm pieces of wood bandaged like the splints, and extending beyond the heel to prevent accidents. And finally, that in the sea service, and in the army, when either an army is to retreat, or an hospital to be moved, or when a storm is expected at sea, the surgeon should be as carefully advertised of the approaching storm, or of the present movement of the army, as any higher officer, for he has many precautions to take for the safety and comfort of his men.

The surgeon when he wishes to make any part or bandage particularly secure, has it in his power to convert his rollers into a firm case, either by soaking the bandages in whites of eggs, which soon hardens in a very firm varnish; or with the whites of eggs may be mixed a little flour and sugar to make it into a paste, or he may apply any common varnish over his bandages, as white spirit varnish, but that is slow of fixing, and is very thin, or he may strew a little powdered rosin on his bandages before they are applied, and then by soaking the bandages with spirits of wine, the rosin is dissolved, and the whole adheres to the limb with very singular firmness; or finally, the bandages may be soaked with fine and well made glue, which makes a very firm case, and is very far from being offensive.

These methods are all of them more cleanly, less cumbersome, and indeed I think more effectual than the old Arabian method of bedding a fractured limb in stucco or Paris plaster.

Lastly, I would observe, that though in a fracture of the leg or thigh bone, or of the patella, splints are quite unnecessary during the cure\*, yet when the patient rises from bed, rests the weight of the body on the fractured bone, and begins to be exposed to accidents, light but firm splints should be laid alongside of the limb; while he wears those splints he is in a manner under your controul, will walk with restraint, and be careful of using dangerous freedoms with the limb, and thus he may be saved from a second confinement more terrible than the first, as it is incurred by precipitation and rashness.

### SECTION III.

#### *Rules for Compound Fracture.*

The moment you arrive at the place where your patient lies, if called to the spot at which the accident happened, you must proceed to extend the foot, while your assistants hold the limb, and by pulling firmly, steadily, and, remember, very strongly, (for in this case a good deal of extension is required) you get the bone to go back within the integuments, and though perhaps you do not get the bone and the edges of the wound arranged exactly to your mind, you get the foot restored to a right direction with regard to the leg, the bone tolerably covered by the integuments, the patient relieved in some degree from the pain of this protrusion, and the whole member put in such a posture that you can lay it on a splint as a safeguard. There are two forms in which the compound fracture usually presents itself; first, when the patient having leaped or fallen from a height, the bone is merely broken, and protruded perhaps to the length of some inches, then the foot being extended and the bone reduced, you, after laying scraped lint upon the wound, (which presently cakes with the blood) lay it upon a stiff splint, made of fir board, properly covered and padded with cloths, to which the limb being fixed by broad circulars of any common ribbon gently tied, and with proper folded compresses, put for softness under each of those circulars, the whole becomes pretty firm, and can be carried with safety.

Perhaps you have at first only turned down the stocking, or cut the breeches; but the patient being now brought to his own home, you proceed to perform your operations more regularly.

\* See note, page 129. S.



You have had your patient conveyed along with all possible tenderness; but you now proceed to operations which require a degree of harshness, and even of apparent cruelty.

First. You prepare the bed, by lifting the mattress and clothes, and in place of the laced canvass-bottom, you lay boards across the bed-frame, which make the bed hard, and keep it perfectly level and true during the cure. You next, in place of the feather-bed, lay only a mattress above the boards; for a feather-bed permitting the patient to sink down, the body gravitates towards the fractured leg, so as often to make the bones overshoot each other, with a dangerous shortening of the limb. You next cut another mattress into four pieces, and round each piece you sew a piece of sheet; these are laid over the first mattress, and shifted under the patient from time to time. You then lay a pillow for receiving the limb; and having laid your patient on this bed or couch, you proceed to cut off the breeches, stockings, &c.

The first and most important point of practice I have to teach you is, how to reduce the bone; and to instruct you, I must be careful to represent the several possible conditions of the parts. Let us first suppose then, that the tibia protrudes through a very narrow opening, the foot turned entirely over to one side; the bone, as if strangled by the flesh, under these circumstances, it is difficult to extend the limb so as to get the bone to go back again through the skin; but it is possible, and you try it in the following manner: You lay the whole limb quite flat; you make two strong assistants, with both their hands, grasp the leg very firmly below the knee; you then grasp the foot firmly over the tarsus, and behind the heel, with both your hands, and begin to pull gently, steadily, and very powerfully, turning the foot a little from side to side; you also twist a hand-towel round the ankle, and take the assistance of it to give you a firmer hold on the foot, and to make you pull more steadily and equally. But if the bone will not go back, you must give the foot to another surgeon or assistant, and clasp your own hands round the broken part, and with your thumbs, without much reserve or affectation of delicacy, endeavour to force in the bone, which, though it needs this force to reduce it, yet lies easy when it is reduced.

Should it be impossible to reduce the bone, on account of the narrowness of the wound, and its swelling and strangulation, you proceed to dilate the wound; you try to push in your forefinger, or your little finger, to conduct the bistoury, or, if necessary, you push in the bistoury, which makes way for itself; it is the straight probe-pointed bistoury you use. You have only one danger to avoid, that is, the cutting of the tibial artery; and to avoid that, you keep to the inner side of the leg, and op-

posite to the highest ridge of the tibia (not to the outside of the tibia, for the artery lies in the middle, betwixt the tibia and fibula;) you run your bistoury forward, and carry it pretty deep, till your finger, which follows behind the bistoury, passes in easily, and till you feel the stricture quite relieved\*. But if you find the bone splintered with points and spiculæ, which (if it were reduced) would run into the flesh, instead of reducing the bone in this dangerous condition, you cut off the sharper points with the cutting forceps of an amputation-case; and having smoothed the bone, you may then, after dilating the wound, reduce it safely.

If you find, at the same time, the bone strangled by the narrowness of the wound, and pointed at its extremity, so that it would be dangerous to return it among the soft parts; if you are sensible that the bone is broken so obliquely, that though reduced, it would not keep its place, but allow the other bone to shoot over it, and at the same time so sharp pointed that the spiculæ would run into the flesh, you have then to make your election betwixt the two operations of dilating the wound and of cutting the bone; and as you prefer cutting the bone, you proceed not merely to smooth it with the cutting forceps of the amputation-case, but to amputate it in the following manner: Your assistant takes a flat iron spathula to defend the soft parts with from the teeth of the saw, lays it flat under the bone betwixt it and the flesh, he holds it steady by one or two fingers on each side of the bone, and presses or draws it up edgeways betwixt the bone and the flesh, and the spathula being thus fixed, you proceed to saw the bone, as close as possible to the wound, with the small spring-saw, commonly put into the amputation-case for the purpose (though never used) of sawing the finger-bones.

Let us next suppose that the bone does not protrude, but that a loaded waggon has passed over the limb, and that the bones have been so crushed, that through one great wound a large piece of the tibia has been squeezed out; that the separated piece of the tibia projects, and is easily pulled away; that upon introducing the finger through this lacerated wound, you feel the bones all shattered, the splinters loose and moveable, the tibia destroyed to a great extent, of three or four inches, according to the broadness of the wheel, and that upon insinuating your finger, you hardly distinguish the lacerated flesh from the bruised bone. In dressing a limb thus shattered, you take away the pieces which are entirely loose, because they are plain-

\* In making this incision you must keep the knife very close to the bone, for fear of wounding the posterior tibial artery. S.

ly destroyed, and must produce suppuration; you are at pains to get away the sharper splinters, though not so entirely detached, because they excite spasms by their immediate irritation, and cause abscess after abscess till they are discharged; you use the finger more than forceps; you would spare no present pain in order to put the parts in a good condition for laying easy, and recovering their healthy state; and although you would take away whatever splinters might cause abscess, you would not work too long with your finger, nor pick with your forceps too curiously, lest you should cause more suppuration by your own imprudence. But I might give you a volume of directions, and still be obliged to conclude at last, that I must leave much to your discretion and good sense.

Let us next suppose that the crushing of the bones is accompanied with a bursting or laceration of the arteries; the blood always streams from the limb, and cakes about the wound soon after; often small arteries bleed smartly at first, but shrink before you can attend to them, and close entirely by putting a little bit of lint to the wound; but when the tibial artery, as often happens, is wounded, it bleeds so as to require attention. Sometimes you have occasion for the needle, but very rarely; for such is the effect of the laceration, whether by opening the cellular substance so as to receive the extravasated blood, (or in what other way it is immaterial to determine) that even the tibial artery stops by merely applying to it a pellet of lint\*. If the artery continues to bleed, you must take a piece of sponge, well dried, apply it as close as possible to the mouth of the artery, and make one of your young men hold it down for some time with the point of the finger.

But there is another kind of hæmorrhagy still more perplexing: the arteries are sometimes wounded from within by the sharp bones, the blood is extravasated, you open a large ecchymosis with the lancet, in order to prevent extensive suppuration; the extravasated blood flows out, the skin falls down again, no more blood collects in that place, and you think all is right, and have no apprehension of any large artery being wounded, when suddenly, and at the distance of two or three days, a considerable artery begins to bleed from the bottom of the sac, and after bleeding outwardly, it threatens (when prevented bleeding openly) to inject the whole limb with blood.

Wherever an artery thus threatens to produce successive and dangerous extravasations into the cellular substance, you must cut up the skin and muscles to the place where the bleeding artery is, and although sometimes you may have occasion to use

\* Never trust a wounded tibial artery to any thing but a ligature. S.



the needle, generally (even in this kind of hæmorrhagy) you have but to apply a piece of sponge.

Let us next suppose, that in place of the leg, the thigh itself is fractured. There is, in this case, less laceration than when two bones, as the Tibia and Fibula, are broken; there is in general one simple wound, and one pointed and projecting bone, but the strangulation round the bone is great, the reduction of it by extending the limb is almost impracticable; the finger is not allowed to pass into the wound, and when, by a little dilatation with the bistoury, the finger is admitted, the surgeon feels sensibly strong bristles of the muscular flesh, and considerable resistance from the tendinous firmness of the Fascia-lata. This is the case where (whatever we may determine as to the pinching off of splinters, or reducing the bone to a right shape) we choose to dilate the wound, both because of its natural narrowness, and because there would be unquestionably great danger of stricture, were the Fascia-lata left entire; for when the whole thigh is swelled, the tension of the fascia makes that inflammation run into gangrene, which might otherwise have passed on to an easy suppuration, or might almost have admitted of adhesion.

In the thigh, then, so fleshy and muscular, and covered with this firm Fascia, the blunt bistoury should be carried pretty boldly forwards, and the wound very freely dilated.

### *Of Dressing the Wound.*

When, after a fracture, the patient, by falling forwards upon the broken limb, has forced the tibia or thigh bone through the skin, the wound is not large, the flesh is cut, and not much lacerated; it is not only possible to make it adhere, but perfectly proper (after reducing the bone), to bring the lips as close as possible, and stitch them together, as you would do the integuments after the great operations of Hernia or Trepan. When, after a more terrible accident, the limb being torn by machinery, or by carriages passing over it, the laceration is great, you may be able, with the help of the needle, to bring two points of the wound together; but the sides can seldom be made to meet fairly, stitches are seldom useful, the sides of the wound are to be generally supported, by laying small and thin pieces of lint on each side of the wound; these pledgits of lint are soon soaked with blood, which cakes and adheres to the open part of the wound. By making small rolls and compresses of linen and soft lint, which you lay upon the edges of the wound (at those particular points where you apprehend a gaping of the lips, or where you apprehend that suppuration and cavities will form),



you keep the parts very close. You then lay up the tails of the eighteen-tailed bandage about the limb, and though you cannot use a roller (because that would require the lifting of the limb from its pillow at every turn), you give as much firmness as possible with the eighteen-tailed bandage. The steady firmness with which you support the parts helps the adhesion, prevents suppurations, and hinders an afflux of blood to the limb; over all, you may pour a little of some spirituous balsam, as the Balsamum Traumaticum.

When the limb is thus dressed, the wound which, while the bone protruded, seemed so very formidable, is very small, the pain is relieved, the very firmness of the limb is agreeable to the patient; you then apply the outside splints close to the limb, tie them moderately firm with their ribbands, and having, perhaps, bled your patient, you give him an anodyne and compose him to sleep; it is now that a situation which seemed very desperate is changed into a state of hope and expectation.

#### *Of the stage of Suppuration.*

Though you expect to procure adhesion, or at least to make some part of the wound adhere, you are often disappointed; you are sensible, from the violence of the fever and the swelling of the limb, that mischief is going on within. The dry skin, the parched mouth, the thumping pulse, the restlessness and delirium, continue for some days, and there is a blackness round the wound threatening gangrene. But this fever by degrees becomes less violent, the livor, which proceeded partly from ecchymosis, partly from the dark colour of the inflammation, gradually changes to green, the great wound begins to suppurate and open very wide, the whole limb swells to an enormous degree, the skin and cellular substance are soft and relaxed, and bear the impression of the finger, the redness extends over all the limb, and from the particular hollowness and softness of certain points, you are sensible that great suppurations are forming within.

Suppose you are called to recover a limb in this ruined condition, you first lay it in a large tin case which opens and shuts; or upon a large splint lined with sheet-lead. You next wash the limb with soap and water, clean it from its filth, lay pieces of fine spongy lint upon the wound and upon the various openings. You then make the whole thoroughly dry, and moisten the surface a little with a sponge dipped in vinegar and spirits. You next apply adhesive plasters to the sound parts of the limb, which support it, and defend it from the moisture. You lay small cushions of folded lint to support the hollow parts, and

lay scraped lint or small sponges to absorb the moisture; and having one or two small pasteboard splints covered with leather (or covered rather from day to day with clean linen), you lay them along-side of the limb, and by tying two or three such splints on each side of the limb, pretty firm, with separate tapes or ribbands, (which should lie always under the limb) you give a due support to the hollow and suppurating parts, and a comfortable and general support to the whole. The limb lies out meanwhile upon the broad and general splint, which being of tin, or lined with sheet-lead, allows the water with which you occasionally clean the limb, to run off.

You are careful to dress the limb every morning, and perhaps to clean it also a little in the evening. By regular washing and wiping with the moist sponge, you prevent those smells which depress the patient's spirits, and injure his health; and by laying clean\* lint to the wounds twice a-day, you soak up the foul matter; by the occasional use of spirituous tinctures, you stimulate the skin, and keep it in good condition; by washing the excoriated parts with salt water, you relieve the itching. You examine the hollow and yielding parts of the limb carefully, and after each fit of inflammation, you feel anxiously with the point of the finger for any abscess it may have occasioned. You find new suppurations produced, sometimes by the extravasations of blood, sometimes by the pricking of splinters, or sometimes from matter lodging in hollow places; you open such abscesses with the point of the lancet, soak up the matter with scraped lint, and lay small compresses upon the hollow places, by which you heal them, and make the internal parts unite.

The importance of attending to the general health, and even to the most trivial circumstances connected with the ease and comfort of the patient, is very great; you should be careful to have the windows open and the room ventilated, to change the linens, to make your patient wash his face and hands with cool vinegar and water, and when the matter is very profuse, to have the room fumigated with vinegar. You give nourishing food in small quantities, wine according to the constitution and habits of the patient, anodynes according to the degree of pain, fever, or restlessness, and laxatives when they are required. You give astringents and anodynes when the diarrhœa is violent; you give sometimes gentle emetics upon the attack of nausea and fever; and as for bark, I believe, in place of reminding you to give it when the suppuration is great, I must rather (so common is this prescription) advise you against overloading

\* Pressed sponge is much better, as it absorbs a much greater quantity of matter. S

your patient's stomach with this heavy drug! three or four drachms of bark is enough to sicken the appetite of a man in health, much more of a man confined for six months to lie on his back.

How much is due to care and cleanliness, you may judge from this, that in the case of a gentleman who lies in his own house, we often venture to save a limb, which, had the accident befallen a poor man lying in a crowded hospital, must have been cut off.

Often it happens, from the destruction of parts, or the unhappy circumstances of the patient, that all your cares are unavailing! every time you examine the limb, you make discoveries of more extensive destruction, you find the whole limb swelling every day more and more, you find the matter running profusely from the openings, the openings increasing in number, and the suppurations extending from the ham to the heel, with intolerable fætor, the muscles all undermined, and the bones carious. You find that you are no longer able to support the patient's health, that repeated attacks of diarrhœa and fever have reduced him to extreme weakness! and the wan visage, the pale and flabby flesh, the hollow eyes and prominent cheek bones, the long bony fingers and crooked nails, the quick, short breathing, and small piping voice, declare the last stage of hectic and debility! the natural powers are then sunk so low, the appetite for food, and even the desire of life so entirely gone, that we would believe the patient past all help, did we not know by experience that it is never almost too late to amputate the limb.

Now, it is come to that crisis when our patient must die or part with the limb he has suffered so much to save; but he is wearied out with suffering, and consents easily to whatever we advise; and whatever the difference of opinion on the first consultation, when the limb was first laid on its pillow all bleeding and shattered, with its bones projecting and its arteries torn, there is none now that it is thus undermined with suppurations, with universal caries of the bones; the first was a state of expectation, the second is a condition where we must despair. When we are thus sensible that further attempts to save the limb are incompatible with the life of the patient; when we perceive plainly that the limb thus mangled, shortened, and imperfectly cured, would be rather a load to the patient, and a perpetual reproach to the surgeon, we perform amputation! there can be no difference of opinion now, because the experiment of trying to save the limb has been tried, and has failed.



*Of Gun-Shot Fracture.*

Gun-shot fracture is the one which, though by far the most formidable, appears at first the least dangerous; it is a small circular wound which admits the finger, has little sensibility, is often bloodless, and when the patient is struck, he feels rather surprise than pain; but when the bones are fractured, the pain is sometimes very exquisite, and always the wound degenerates in consequence of the destruction of the bone into a fœtid sore, with fistulas, foul matter, and a discharge of carious bones.

When a wounded man is brought to you, you find, perhaps, one single wound in the thigh, the limb bending, the bone broken, perhaps some large branch of the profunda bleeding profusely, and the man faint and sick. You immediately lay him in the floor of the cock-pit, or when brought to your tent in the field of action, you lay him upon a bed, or upon the bare ground. You lay a large splint (or any coarse board, any spar of wood) under the limb, to prevent it bending and being more injured: if the blood flows profusely, you thrust a piece of lint into the wound, and hold it steady with your finger; you call your assistants, and one gives him a cordial, another cuts off the breeches, while you, by pressing with your finger, prevent loss of blood. The wound being in the thigh, where strangulation from tension of the fascia is to be feared, you are more willing to dilate the wound; and the bone being shattered, and a large artery bleeding, (for in a gun-shot wound no small artery ever bleeds) make the dilating of the wound a matter of absolute necessity. Your finger then being kept steady upon the wound, is to conduct your bistoury; you lift your finger, draw out the bit of lint, pass your finger into the opening, push in your probe-pointed bistoury upon the finger, and as you open the wound, you push your finger deeper, until you feel distinctly the jet of warm blood; then fixing the point of your finger fairly upon the mouth of the artery, you lay it open, and, according to its size, either tie it with the needle, or suppress the bleeding by pressing a morsel of dry sponge down upon it.

Your assistants now extend the limb, and hold it very steady; while you push your finger deeper into the wound, you hook out the splinters of the bone, then you feel a piece of cloth, or a button of the breeches, and with the help of a probe, or lever, or dressing-forceps, you hook it out; you find a piece of the ball, and also pick it away, but you are sensible that the rest of the ball, or that one of two balls, with which your patient was shot, lies very deep; you find the wound extending beyond the reach of your finger; you find that it has passed almost through



the thigh, and having reason to believe that the ball is near the skin on the opposite side, you make an incision there, (called a counter-incision) and extract the ball, together with whatever splinters of bone are driven to that side.

The shot having passed through the thigh-bone, you get out the ball, pieces of bones, cloth, buttons, keys, sword, belt, and other foreign bodies in this way, with the finger: when the shot has passed through the fore-arm, or tibia and fibula, or through a group of bones, as the carpus or tarsus, it is sometimes useful to draw a slip of dry linen through the wound with your long iron probe.

The wound being thus cleared, you proceed to dress it, not with any expectation of procuring adhesion: that in gun-shot wounds is impossible: you never pretend to stitch a gun-shot wound. You put adhesive plasters round the limb, because you know that it must lie long soaking in suppuration; you bring the wound close together with compresses upon the sides of it, a piece of fine lint over the mouth of the wound, and you bind it with a strip of fine linen. You lay the member on a firm splint, or case of tin, to prevent any bending of it, and you dress it always perfectly dry; you pour sometimes a little spirits upon it, using no poultice, nor any thing but compresses of dry lint, padded splints, and circulars of ribbon to tie them with, and to support the limb. You should never forget this circumstance, that the rangers in the woods, who never are within a house, who are continually exposed to fresh air, in constant motion, and living from necessity on a spare diet of the coarsest kind, who merely bind up their wounds with a piece of lint and a slip of linen, recover to a miracle! while those who are nearer what is called help, who are thrown into a foul hospital, and who, if they are able to walk, loiter about in idleness and nastiness, or who, if wounded in their lower extremities, lie with oils, poultices, and rancid ointments, applied to their limbs, infallibly sicken and die.

In the progress of such a wound, the sloughs will come away spontaneously; the suppuration need be encouraged in no other way than by supporting the general health; the carious bones will usually be discharged of their own accord; perpetual care is required in keeping the wound clean, close and dry. The way of curing the fistulous sores that remain after gun-shot wounds, has been already explained.

*Of Compound Fracture and Luxation, when the Joint is distorted, the Bones fractured, and the Integuments lacerated.*

It is in the lower extremity only, which bears the whole

weight of the body, that we are to look for such complication of injury as is described in these words; and however a compound fracture of the arm, or fore-arm, may destroy the part itself, life is actually in danger only in great fractures of the lower extremity, which forms so great a proportion of the whole body. Whether the Tibia only is protruded, or the astragalus displaced, or both, you perform the same operations; and whatever may be the decision of a consultation afterwards, your duty is immediately to replace the foot, and close the wound. Always, you proceed in the first instance as if you had no doubt of saving the limb.

In general it happens, that the Astragalus or Tibia having burst through the integuments, the bones are so strangled in a small slit or opening, that no degree of force will reduce them; you do not, in this case, cut off a bone so necessary to the joint as the inner process of the tibia; you never, unless it be already entirely separated, cut away the astragalus; you first extend the foot very powerfully, and press in the astragalus, and try to reduce the bones; but failing in this, you make a free incision, taking care to avoid the tibial arteries; extend the foot, replace the astragalus betwixt the processes of the Tibia and Fibula, and having closed the wound, you lay a piece of lint upon the lips of the laceration. You then place the limb on a large and stiff splint, in a manner which surely I need not explain, and with such pillows, compresses, and bandages, as you find necessary for keeping the foot in its right position, with regard to the leg.

The limb being thus laid, you are not to promise yourself absolute success, but the surgeons whom you have sent for being arrived, you consult together upon the probable event of the case; and so very favourable is the aspect that matters assume after those operations have been nicely performed, that the consultation will very rarely order the limb to be cut off; they soon leave you to your own prudence, and advise in general terms that every thing should be done to preserve the limb. You are now afloat, and must abide the chance of time and circumstances, for after a day's delay the limb is inflamed, and you never call a second consultation; it is too late (whatever changes come upon the limb) to perform amputation with success; nor, indeed, must you be alarmed at the appearance of gangrene, even in this case, where gangrene is so often the cause of death, for the force with which the parts are twisted, or the bones driven through the skin, occasions an extensive ecchymosis, which reaches along the leg, and up the thigh itself, so that the whole limb is almost black. Nay, you must not be alarmed even though this blackness turn into a true gangrene, though vesicles rise, the

part lose all feeling, and the patient lie in a degree of stupor; for such gangrene is often but superficial; it is confined to the skin; it is limited even to a small portion of the skin, and in eight or ten days small sloughs are thrown off, the suppuration is established, and the patient revives. Such laceration seldom or never adheres immediately, yet is often cured by suppuration; and sometimes, when pieces of the tibia and fibula have been separated and thrown off, when the astragalus has been fractured, and one half of it cut out by the surgeon, the joint has healed; nay, it has even happened that the astragalus has been so entirely twisted out of its place, that it has mortified and been removed by the surgeon, and yet the gangrene has ceased, the suppuration has been established, granulations have filled up the great hollow, the outward wound has closed, and (though it is difficult to believe so surprising a fact) the bone has been so far regenerated, that the patient has walked firmly on that foot, and with a free motion of the ankle, a new joint having been formed. Yet you should be aware, that such cures are never perfect; after even the least of those accidents the joint continues long weakly, always rheumatic, apt to swell with the slightest fatigue, and requires to be firmly supported by a well-padded buskin laced firmly round the joint: I have seen some patients, indeed, who did not absolutely need this, but few who did not acknowledge the comfort, security, and strength it gave them.

## DISCOURSE XII.

ON THE ACCIDENTS AND DISEASES OF THE  
HIP JOINT.

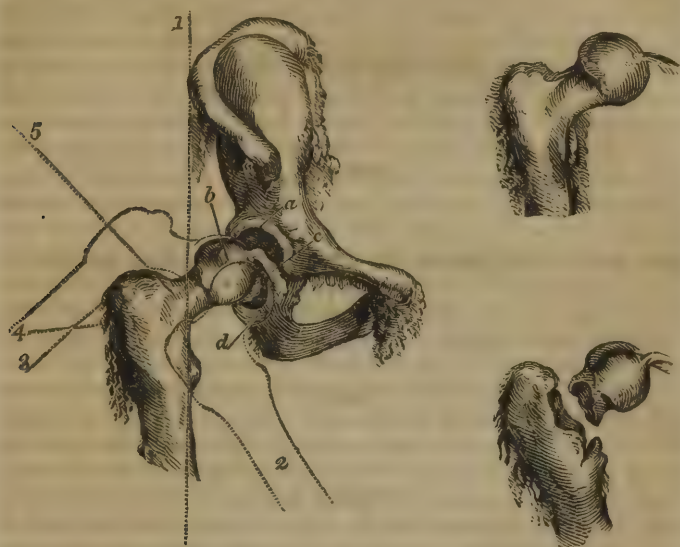
## SECTION I.

*Diagnosis of the various accidents and diseases of the Hip  
Joint.*

**I**N distinguishing the various affections of the hip joint, we can trust nothing to the opinions of the older surgeons, so entirely unacquainted with the scrophulous disease, and so inaccurate in their distinctions of all the other affections of the joint. Nor is it indeed by authority and the facts of others that we should be guided in the practice of our profession, but rather by reason, by our knowledge of the structure of the parts, and in the present case, by observing the various distortions and shortenings of the limb; for it will be found, that from the peculiar structure of the hip joint, certain accidents will produce invariable appearances, and luxation, fracture, or injury of the acetabulum, will give infallible signs of distinction by the peculiar distortions of the limb. I well know how difficult it is to remember correctly the forms of any internal part, and how much more difficult it is to apply such anatomy to the peculiar circumstances of each case; how impossible it is to reason upon luxations and fractures as abstract subjects, without some sensible representation of the facts; it is for this reason that I think



it advisable to accompany each difficult point of the diagnosis with a simple plan.



The first plan that I lay before you, is such a scheme of the hip joint as will explain decidedly the effects of blows or falls in various directions. (a) Marks the deepest part of the socket which entirely receives the round head of the thigh bone, and upon this point the whole weight of the body rests. (b) Next marks the head of the thigh bone raised and turned a very little out of its acetabulum, in order to show the hollow of the acetabulum and the root of the round ligament. (c) Marks the round ligament which arises rather from the lower margin of the socket, and which prevents the head from starting out of the socket, or being luxated upwards till this ligament is burst; and indeed it would seem as if the weight of the body were in some degree supported by this strong ligament, though the weight is chiefly balanced upon the head of the thigh bone. (d) Marks that deep part of the socket where the mucous ducts and fatty fimbriæ lie, and where the inside lining of the capsule is most peculiarly delicate; and since the body hangs by the upper part of the socket on the top of the thigh bone, this delicate apparatus, lurking in a small dimple at the lower part of the socket, escapes all dangerous pressure, and is but gently moved as the central ligament moves.

With the plan of the joint thus before us, nothing is more

easy than to judge, with almost mathematical precision, of the effects of each particular blow or twist. 1st. In the perpendicular posture of the body, when the pelvis rests fairly on the head of the thigh-bone, the neck of the thigh-bone bears its full share of the weight; and in falling from a height upon the feet, or in dropping from a window, or in falling with force upon one knee, or in taking a high and dangerous leap, the whole weight of the body strikes upon the head of the thigh-bone in a direction transverse to that of the neck. The resistance of the ligament from below, and the deepness of the socket above, prevent luxation upwards, and the neck of the bone breaks across. The direction of such a shock is indicated by the dotted line (1). A blow in this direction, then, may fracture the neck of the thigh-bone, or may so bruise the socket, as to produce disease, but can never hurt the lubricating apparatus, which is safely lodged at (d), where there would in that case be no pressure.

2d. A fall in which the foot slips inwards, the limb is twisted, and the body falls on one side: in short, when the thigh is distorted in the direction marked by the dotted line (2), the head of the bone is more frequently twisted out of its socket, and luxated upwards; the great capsule of the joint is burst; the central ligament is torn up by its roots; and the head of the femur is lodged on the back of the haunch-bone, or in the sciatic notch.

3d. But when the person slips his foot, so that the inside of the ankle slides along the ground, and that the limb is twisted outwards; or when having a heavy burden on his back, he falls, so that the inside of the knee strikes the ground; or when, as in laying a sack of corn from his back upon a cart, he makes one step away from the cart, and the sack falls upon his extended leg, so as to twist the limb outwards; then the thigh-bone comes into the direction denoted by the dotted line (3), the head of the thigh-bone is turned downwards towards the lower part of the socket, and is easily luxated in that direction, because there the socket is imperfect, its border is low, and guarded only by a ligament (the *ligamentum labri cartilaginei*) while the central ligament prevents only luxation upwards, because its root arises near this lower border of the acetabulum.

4th. It is very obvious, that when the thigh-bone is struck in the direction of the dotted line (4) by a fall upon the trochanter, its head is beaten down into that part of the socket where the mucous ducts lie, and these soft parts are bruised, whence comes immediate and dreadful pain, high inflammation in the joint, and sometimes suppuration, and carries off the acetabulum, followed by ankylosis.

5th. When the great trochanter is struck obliquely from above downwards in the direction of the dotted line (5), any of all those accidents may ensue, for the head of the bone is struck so downwards into the socket, that very frequently the mucous ducts are injured; or being struck thus obliquely, the head of the bone may be luxated downwards, by being driven over the border of the acetabulum at its shallowest part; or, finally, by being struck thus obliquely, the neck itself may be broken.

In enumerating these consequences, it is to be observed, that the effect of no particular blow is absolutely limited, while yet it may in general terms be affirmed, that luxation is produced by a twist of the limb; fracture of the neck of the thigh-bone by a desperate leap or fall from a height; while falls in which the trochanter strikes the ground, though they do sometimes luxate or fracture the thigh-bone, more commonly injure the acetabulum, and its lubricating apparatus. It must be matter of wonder, indeed, how, since the soft parts within the socket are so easily injured, they ever escape disease in any of the common accidents of the joint: but it is to be observed, first, That the bone is luxated or fractured by blows or twists, which tend rather to turn the head out of the acetabulum, than to drive it down into the cavity. Secondly, That the mere laceration of an internal part, as of the central ligament, heals very easily; for in every case of luxation it must be torn, and yet no disease ensues. Thirdly, The actual fracture or luxation produces no disease, because that peculiarity of constitution is wanting, which produces in boys the most dismal consequences from the slightest accidents, not in this joint only, but in all the joints. And, lastly, We find, that even when, in consequence of inflammation arising from mere local injury, the bones do inflame and throw out callus, it is a healthy inflammation, like that of a granulating wound, and stops spontaneously as soon as the callus is formed, and the re-union of the neck of the thigh-bone, or the formation of the new socket, completed. The actual condition of the limb may be ascertained by the following marks:

1st. The limb being sound, or but slightly hurt, is moveable, but not loose; the joint moves easily and smoothly; you can turn the thigh-bone in every direction, though not without a degree of pain proportioned to the injury; and this is principally to be noticed, that the point of the haunch-bone, the knee and the great toe, are all in one direct line; or, in other words, the leg, thigh and body, all lie in the natural direction, with regard to each other; and the limb being measured with its fellow, is of the same length, and answers knee to knee, ankle to ankle, and toe to toe; for though the patient will naturally dis-

tort the leg to give himself ease in the bruised part, yet the surgeon can, by a little force, make the limbs even. Figure 1st.

2d. When the thigh-bone is luxated, the limb is always immovably fixed by the entireness of the neck of the bone, and the awkward posture in which the head lies against the pelvis; and when the thigh-bone is luxated upwards, we have the following decisive marks of its condition: The head and neck of the thigh-bone are firmly braced down against the back of the pelvis by the surrounding muscles, whence the limb, which lies in a very awkward posture, is absolutely immoveable. The head of the bone having started fairly over its socket, and lying even as high as the sciatic notch, that is, at the distance of three, or rather four inches from its natural situation, the limb is very remarkably shortened, the heel of the luxated limb touching the sound one a little higher than the ankle. Next the neck of the thigh-bone being entire, and the head of the bone looking backwards towards the sciatic notch, the whole limb is singularly distorted, the toe is turned inwards, or rather backwards, and the knee of the luxated limb falls in behind the thigh of the sound one, and in this awkward posture the limb is so immoveably fixed, that when you attempt to turn the thigh-bone, you give great pain; in the moment of the attempt, you are sensible of insuperable resistance; indeed, if you could turn the thigh-bone, you would reduce it.

Now, when the limb is thus luxated upwards, if you lay your patient on his belly, you will find the leg half bent, and standing up at right angles with the thigh; and taking the leg in your left hand, and working it like a rudder, backwards and forwards, laying your other hand at the same time flat over the haunch, you will be sensible, every time the thigh-bone is turned, of the ball or head of it turning under your hand; and when you persist in turning it very largely and rapidly, you will be very sensible of the head and neck of the bone clucking against the haunch-bone. But of all the marks, none is more particular than this, that the great trochanter rises very high, the prominence which we call the haunch, seems to be transferred very high up upon the hip, the thigh is remarkably shortened and flattened, and when you first begin to roll the thigh-bone, and to feel the joint, you would be apt to mistake the trochanter for the head of the bone, and the clucking noise of the luxated bone for the grating of a fractured one. Figure 2d.

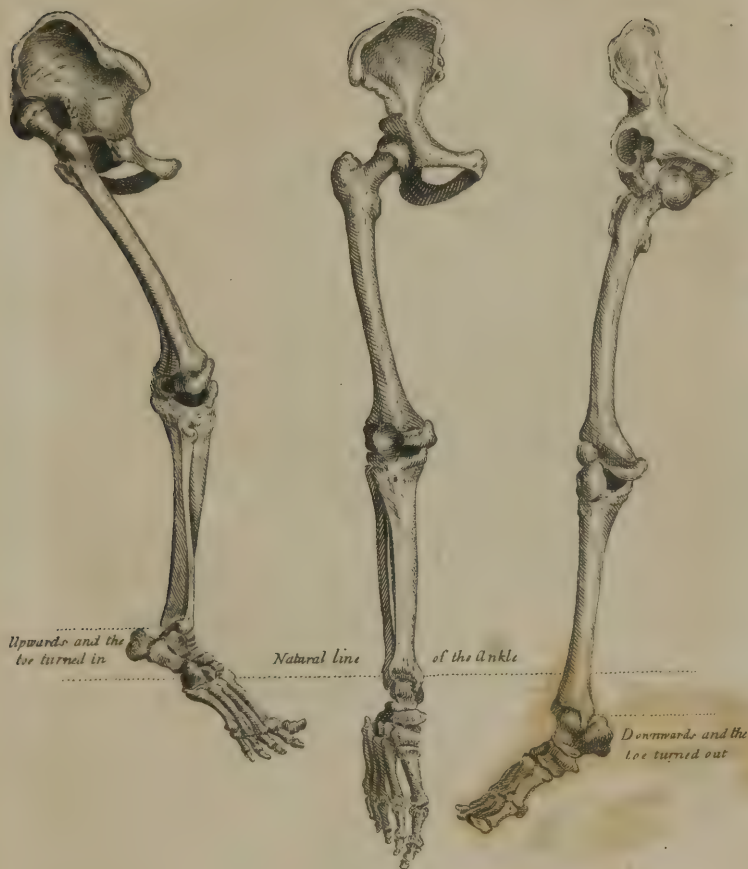
3d. When the thigh-bone is luxated downwards, the bursal and central ligaments are lacerated, the obturator muscle which fills the thyroid hole, is in part torn up from its origin, and the head of the bone is lodged in its place; the turning or rotation of the thigh-bone is in this luxation also entirely prevented by



*Fig 2. Luxated upwards,  
explained. Page. 154*

*Fig 1 Natural, explained,  
Page. 153*

*Fig 3 Luxated downwards,  
explained Page 155*



*Sketch for the Diagnosis of Luxations*



the awkward posture of the neck ; the head of the bone looks forwards, or rather upwards, and the limb is as much fixed as when luxated upwards.

All the peculiarities of the distortion first described, are reversed in this luxation ; the head of the bone is now lodged in the thyroid hole, a part of the pelvis so much lower than its natural socket, that the leg is lengthened fully three inches. The head of the bone in this luxation looks forwards and upwards, so that the toe, which was turned inwards in the luxation last described, is turned outwards in this ; and the head being now turned forwards, the knee, which in the upward luxation lies under the sound knee, is in this turned remarkably outwards, while the whole limb is kept in a very remarkable manner straddling away from the body. In the luxation upwards, the head of the bone is less distinctly felt, because the trochanter is apt to be mistaken for it, the head and neck lying deep under the glutæi muscles ; whereas in this luxation, the head of the bone is felt rolling very distinctly and superficially in the groin, very nearly in the place of the venereal bubo, for at this point the joint of the hip is not covered with large muscles, such as the Glutæi, but with one thin and flat muscle, the Pectineus, and the joint is so near the surface here, that the suppuration in the hip-joint disease usually bursts first in the groin. Figure 3d.

4th. The peculiar signs of fracture of the neck of the thigh-bone, are not less decisive. The moment the neck of the thigh-bone is broken, the bone is retracted by the power of its muscles ; it is turned somewhat round by the rotatory muscles (the Obtur. Internus. quad. Femoris, &c.) operating upon the shaft of the bone ; and while the head and neck of the bone remain in the socket, the broken part of the bone at the root of the trochanters mounts upwards. The following signs then must follow those peculiarities in the posture of the bone. First, the moment the neck of the thigh-bone is broken, the shaft of the bone is so retracted by the power of its muscles, that you would imagine the bone to be luxated upwards ; secondly, observing next the posture of the leg, you find that the toe is not turned inwards, nor the knee of the hurt limb bent in under that of the sound one, it is turned outwards, but not in that fixed, awkward, and straddling posture, which indicates luxation downwards. Thirdly, you next begin to turn the limb and to hearken for crepitation ; but you will remember that this fracture is distinct from all others, in having no crepitation, for the ends of the broken bone are not opposed to each other (as where a bone is broken across its middle) but the broken neck of the bone remains in the acetabulum, while the part (i. e. the root of the trochanters) where the neck of the bone was broken away from

the shaft is so retracted, that the fractured parts are never opposed to each other, unless indeed in the moment of extending the limb with the design of setting the fracture, for then the limb being drawn out nearly to its natural length, the fractured parts come to be opposite to each other, and the crepitation is distinguished. Fourthly, It is to be observed, that the limb cannot be fixed and embarrassed by the neck of the thigh-bone, as in luxation; the connexion betwixt the head and shaft of the bone is destroyed; the limb is not only free, but absolutely loose; the natural thigh-bone moves easily, but the broken thigh-bone turns loosely, as far as a bone can turn loosely which is encumbered with such a mass of muscles lying about it.

This also is very particular; it turns vertically like a spindle. If you take in your hand a sound limb with the design of turning it, and lay the palm of your hand over the trochanter, you will be sensible that the bone moves slowly and steadily, because it is connected with its neck. The head of the bone is the centre of the motion, the trochanter is at the distance of three inches from that centre, and moves in large circles, of which the thigh-bone is the radius; but when the shaft is broken from the trochanter, the bone is it self the centre of motion, the trochanter turns vertically in its place without making it merely its axis.



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The fracture of the neck of the bone is easily distinguished from luxation, by the ease with which the limb is turned, by the thigh-bone turning vertically upon its axis, by the leg being much shortened, easily lengthened by extending it, but very difficultly retained. But though I affirm that the thigh-bone is easily turned and moved in various directions, I mean so only in reference to the mechanical resistance, for it is not moved without dreadful pain; the ragged trochanters, and broken part of the bone, are lodged among the soft parts, and every time you try to draw the leg outwards, the patient suffers dreadful pain from the pressure of the broken part of the femur against the lacerated parts which lie on the back of the haunch-bone; thence it is, that the patient is no



sooner laid in bed than he inclines the knee inwards, and distorts the limb, in order to raise the broken end of the bone, and prevent it pressing against the lacerated flesh.

This last observation reminds me of the necessity of explaining two doubtful points in the diagnosis; first, it is not certain that the toe is always turned outwards; secondly, it is not certain that the limb is always immediately shortened. You may have observed that Paræus describes the toe as turned inwards, "the limb shortened, and the foot turned inwards." Petit also, in his *Maladies des Os*, mentions, that being called to a patient under the care of a surgeon who had not read Paræus, and who mistook the nature of the injury, "he found, upon undoing the bandages, the great trochanter four inches higher than its natural situation, and the toe and the knee turned inwards." But it should be remembered, that the ease with which the thigh-bone turns vertically, or in other words, the ease with which we turn the toe outwards or inwards at pleasure, is among the most decisive marks of this kind of fracture; that though the toe is naturally turned outwards by the action of the rotatory muscles, yet we can easily turn it in; this implies that the patient himself can turn it in. He often does turn it in that he may lie with greater ease; and accordingly you will often find the patient lying with the toe turned in, and the knee of the hurt limb turned under the knee of the sound one, for in this posture the fractured part of the bone is lifted up from the lacerated flesh. In short, there are two postures of the limb: first, That which it takes while the parts are insensible immediately after the accident; secondly, That which it is instinctively put into for ease after the patient is laid in bed. But though the posture of the limb comes thus to be nearly that of a luxated thigh, viz. the limb shortened, the toe turned in, the one knee falling under the other, yet still fracture is easily distinguished from luxation by the mobility of the the limb.

Secondly, There is one point more in which there is a degree of uncertainty, for the most decisive symptom of all is sometimes wanting, I mean the shortening of the limb: The shortening of the limb in fracture of the neck of the thigh-bone, is not, as in luxation, the unavoidable effect of the posture of the bone; it is an accidental consequence of the contraction of the muscles, and sometimes these are so benumbed by the injury, or so inactive from some other cause, that they do not pull up the thigh-bone. Even though we were less able to explain the fact, we are not less constrained to receive it, it stands upon record. Sabattier has, in consultation with Louis, Foubert, and Goursoud, seen on several occasions the neck of the thigh-bone

broken, the limb remaining of its usual length, and the retraction happening suddenly, from the patient being turned rather rudely in bed by the helper of the hospital. Sometimes this retraction has taken place on the fourth or fifth, sometimes not till the twenty-third day after the accident.\*

The causes then of luxation and of fracture, are as different as the causes of hydrocele and aneurism; fracture always, or almost always, arising from a fall, a blow, or a violent strain of the muscles; while luxation as certainly arises from a sudden twist of the joint, when the weight of the body, in some awkward posture, is thrown entirely upon the joint, and the limb is so far out of its natural direction, as to be entirely beyond the power of its own muscles.

## SECTION II.

### *Of Luxation.*

In what degree the ligaments of the joint will extend when they are gradually dilated by a collection of serum within, we need not at present dispute. Unquestionably they are capable of distension, of almost incredible distension; but that the head of the thigh bone should be all at once displaced by a twist, forced clear out of its socket over the back of the haunch bone, and lodged in an instant at the distance of four inches from its natural place, without laceration of its ligaments, with its ligaments merely dilated, is impossible. There is, indeed, no fact of which we are better assured than this, that when the head of the bone is twisted out of its socket, there is no dilatation of the capsule, there is no subluxation, as it is called? the head of the bone never stands upon the edge of the socket, for then it would immediately fall back into its place; but the capsular ligament is burst, the central ligament is torn up from its root, the muscles which lie in the thyroid hole, or on the back of the haunch bone, are displaced, to make way for the head of the thigh-bone, which lies betwixt the naked haunch bone and those lacerated muscles, and there it remains, undergoing changes which are of the most interesting nature.

### *Of Luxation of the Femur downwards.*

1st, While the head of the bone lies thus among the lacerations

\* When the fracture takes place within the capsular ligament, if this is not torn, its strength prevents this effect from immediately taking place. S.

ted parts, the slightest motion occasions excruciating pain, and as the slightest motion prevents adhesion, the head of the bone continues long reducible. When the bone is first driven out of its socket, the patient hears the crash of the lacerating ligaments, and when a recent luxation is reduced, the head of the bone being distorted in respect to its posture, and very firmly braced down by the contorted muscles, goes home into its place with a violence proportioned to the tension of the muscles with a loud snap; but when an old luxation is reduced, the reduction, which is opposed by the strong adhesions, requires a force equal to that by which the bone was luxated, if not greater; and in the instant in which the adhesions give way to that force, the patient and the surgeon both feel the same crash of laceration which accompanied the first displacement of the bone; it often sounds as if the neck of the bone were broken by the violence. This is the sign of the luxation being reduced, and the surgeon should be aware of it; for I have often been sensible of this crashing and laceration among the ligaments, which announces the yielding of the dislocated bone; but as the head of the bone does not, in such old luxations, go home with a sudden nor distinct snap, the extension has, to my certain knowledge, been often continued, even after the bone has been reduced, and that with a degree of violence almost sufficient to tear the limb from the body. Observe this in your future practice, and you will find that I am not incorrect; and if what I have alledged be true, the *vis percussio*nis (far from being a subject for thoughtless jokes) is perhaps absolutely necessary to the reduction of old and confirmed luxations.

2d, Though the capsule so entirely surrounds the joint, that it can in no case escape sudden laceration when the head is driven from its socket, yet the muscles, which are small, which turn round the joint with small tendons, and are implanted about the roots of the trochanters, and are but slightly connected with the capsule are very seldom torn. The head of the bone bursts through the capsule, and tears it in a very irregular way; but it passes out betwixt the tendons of the muscles, without tearing them; therefore it happens, that as soon as the bone is reduced, as soon as the head of the thigh bone is drawn out from among the lacerated parts, and again lodged in its proper socket, all pain ceases, the patient exclaims that he is relieved; and as the muscles preserve their attachments to the bone, and are now restored to their offices, he moves the joint as easily, and walks upon it as firmly as before, and returns to his business or pleasures sometimes without one day's interruption; and though the capsule is completely lacerated, yet as it is connected on its external surface with the surrounding parts,



and these also are injured, they swell, and the surrounding parts being close, the edges of the lacerated capsule are regularly opposed to each other, and the entireness of the capsule is soon and easily restored: rest is not necessary to these adhesions.

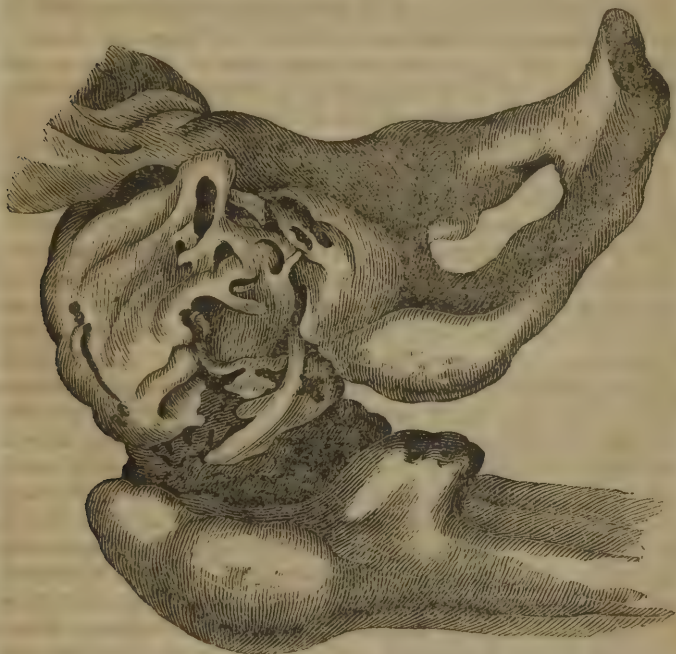
3d, When the head of the bone *remains unreduced*, new and important changes take place on the head of the bone itself, and on the part against which it rests. When the thigh bone is luxated downwards, it displaces in some degree the obturator muscle, and rests in the hollow of the thyroid hole covered by the lacerated muscle, and pressing against the bone, and there it lies braced down by the distortion of the other muscles. The surgeon cannot turn it in examining the parts, except in a very slight degree, so firmly is it embraced by the muscles; and besides, the patient is careful to prevent even the slightest motion, for motion is productive of excruciating pain. He lies immoveable for some weeks! the hollow in which the head of the thigh-bone lies, is lacerated and raw; the parts surrounding the neck of the thigh bone are also lacerated, which parts mutually adhere so as to form a new and perfect capsule. The head of the bone resting in the thyroid hole, as in a socket, comes at last to move in it with a degree of ease; and the pelvis, resting thus fairly upon the head of the thigh bone, is steadily supported; and though the leg is much lengthened in this luxation, so as to make the patient halt towards the sound side, yet the limb thus luxated downwards bears up the body firmly.

This is one striking peculiarity of the luxation downwards into the thyroid hole. But still farther changes take place, very slowly indeed, for the changes I mean now to speak of affect the bones themselves. It seems to be after the thigh bone is fixed in its new situation, and after the continuity of vessels is restored, that the bones begin to change their form. The soft parts connected with this surface of the pelvis are all swelled, vascular, inflamed, and in the condition of the periosteum and soft parts surrounding a fractured bone. This mass of active vessels connected directly with the vessels of the bone itself, draws them also into an active state. A secretion of bony matter begins, the new bone is deposited in the now inflamed capsule in the surrounding cellular substance, and among the lamellæ of the obturator ligament, against which the head of the bone rests, and which is of course irritated and inflamed. The thyroid hole comes in time to be filled up with ossification, so as to make a bottom for the new socket. The edges of the thyroid hole sprout out so as to form lips or edges for the socket; and these edges sometimes are so deep as to surround entirely the neck of the thigh bone, and to form a complete box of bone, in which the head of the thigh bone is so enclosed, that though



perfectly moveable, the head cannot be disengaged from its new socket.

Nor does even the thigh-bone itself always retain its original shape ; while excitement enlarges a bone, pressure, on the contrary, prevents its growing in a young person, or even lessens it when full grown. The thigh-bone, when thus luxated, bears the weight of the body in a new direction, the obliquity of the neck is lost, the head of the bone now receives the pressure in one direction only, whence the head of the bone is flattened, and the neck is in time depressed, loses all its obliquity, is shortened, and stands out at right angles from the shaft of the bone ; and as the shoulders and neck of the bone now press against the lower part of the empty socket, that part yields to the pressure, the lower edge of the socket is depressed inwards, and the ge-



I have given in this drawing one of the most extraordinary facts in this department of pathology. I have represented here a thigh-bone which was luxated downwards and backwards into the sciatic notch, and there formed for itself a new socket, where, though entirely enclosed in the box, as the French academicians have chosen to call it, it was still moveable. One thing is very curious, that in this new socket there is a certain opening separated from the rest by a thin partition of bone, through which the vessels enter which supply the joint.

neral cavity of the socket, now forsaken by the head of the bone, is almost filled up.

*Luxation of the Thigh-Bone upwards.*

4. When the thigh-bone is luxated upwards and remains unreduced, the new joint and all its apparatus is less perfect, and the patient continues very lame. The head of the thigh-bone is now lodged on the back of the haunch bone, upon a flat and gliding surface, the head of the thigh-bone obtains a fixed place very difficultly; there is no hollow like the thyroid hole to receive it; the convex head of the thigh-bone is applied to the flat surface of the haunch bone, so as to touch it almost by a mathematical point; there is not here, as in the luxation downwards, a variety of surface and great extent of bone wrought upon by the head of the femur; the generation of bone is very sparing; an accidental socket is indeed formed, but shallow, smooth, irregular, not deep, not sufficient to receive or lodge the head of the thigh-bone; it is rather a dimple than a solid socket, and looks merely as if the haunch bone being softened had been slightly impressed by the head of the thigh-bone. How does the patient walk [then in this case? Very miserably; his thigh-bone rather lies upon the side of the haunch bone than under it, so as to support the weight of the body; the weight of the body is suspended upon the head of the thigh-bone by the strong ligaments that are generated out of the lacerated capsule, aided by that cellular substance which connects the lower surface of the glutæ muscles with the bone. The dislocated leg is remarkably shortened, and when the patient rises on the sound limb to make a new step, the luxated bone hangs in air; and when the dislocated limb is in its turn put to the ground, the whole weight of the body falls heavy upon those thickened ligaments; at every step the patient twists the body, and turns the pelvis so as to throw the haunch bone flat upon the head of the thigh-bone, and this inclination of the trunk, together with the shortness of the limb, distorts the whole body; and in this case the weight falls so heavy upon the neck of the thigh-bone, that it gives way under it. The head of the thigh-bone is flattened, the neck is shortened, it is also bent downwards, as if it had given way, as if it had slid a little lower along the shaft of the bone. When we look at the thigh-bone which has been long luxated, we should at first believe that it had been actually fractured, and the neck shortened; but upon examining the neck, we find no mark of fracture, while we easily distinguish many marks of the long continued pressure, for the whole of the upper part of the thigh-bone, even to the trochanters, is extenuated, the neck is somewhat extenuated and bent down, the head also is smaller

than that of the sound thigh-bone, and on the top of the globular head of the thigh-bone is a depression or flatness, indicating the place where the back of the haunch bone rested upon it.

In such a luxation remaining unreduced, the weight of the trunk is ill supported, the motions of the joint very imperfect, the limb remarkably shortened, and wasted in some degree, while the whole person is distorted and bent towards the lame side. Though such luxation happened during infancy, the person never recovers, but continues lame, pained, unable to ride on horseback, easily fatigued, equally unfit for business or pleasure, and reminded of his misfortune every moment of his life.

### SECTION III.

#### *Pathology of the diseased Acetabulum, or Affection of the soft parts within the Hip-Joint.*

The disease I am now to describe proceeds from a fall upon the haunch (as when the foot slips upon ice, &c.) in which the trochanter being directly struck, the head of the thigh-bone is beaten down into the socket, the round ligament, which occupies the bottom, and the mucous fringes, which are contained rather in the lower part of the socket, are violently bruised, whence arises immediate and very terrible pain, continuing for many months. The torture is excruciating, the patient cannot be turned, nor even moved, in the most gentle manner in bed; after, perhaps, a year's suffering, he begins to move about upon crutches, entirely lame.

This accident is clearly distinguished from fracture, because there is neither crepitation nor shortening of the limb; from luxation, because the limb turns easily; and from those and all other affections by this, that though it turns easily, and there is no mechanical obstruction to motion, the patient cannot suffer it to be turned, every motion of the head of the bone rolling against the injured parts of the socket producing delirious and frantic outcries. Sometimes this inflammation of the joint subsides, and after long confinement and torture, perhaps after using warm baths, frequenting watering-places, fomenting and gradually exercising the joint, the patient recovers the use of his limb; but much more frequently he continues lame.

It is not difficult to imagine, and indeed to prove by dissection, various changes by which the joint is destroyed. The first effect of such inflammation and insufferable pain is, to produce a trembling solicitude on the part of the patient to prevent the slightest motion of the limb. The patient lies in all the



filthiness of a sick bed, will not permit a pillow to be changed, or a sheet to be rolled under him; even the trembling of the floor, when people walk rudely, increases his irritability, it not his actual torture. This is almost like a provision of Nature, for motion actually does harm, excites inflammation, brings the inflammation forward to abscess of the joint and caries of the bones, and prevents ankylosis, which is often the only possible cure: the presumptuous interference of quacks with the process of Nature, their daring to twist and turn such a limb, under the pretext of reducing luxation, has actually proved fatal.

The stillness of the patient, and the uniform posture for many months, favours all those changes which are apt to take place in a joint thus highly inflamed. Sometimes the inflammation stops short of ulceration, the capsule, tendons and membranes surrounding the joint, are merely thickened by the inflammation, and the joint remains stiff, rheumatic, but moveable, and, as far as pain will allow, useful. Sometimes, and especially in younger people, the inflammation runs high, abscess forms, and after repeated paroxysms of inflammation and most excruciating torture, the matter bursts out at the haunch or in the groin, with proportioned relief of pain. Often, you may suppose, before the matter thus bursts out, the bones themselves are ulcerated, the capsule is destroyed, the head of the bone is extruded from the acetabulum, and retracted by the force of its muscles upon the back of the haunch-bone; then the leg is shortened; and this is what the ancients called Subluxation, the French, *Luxation Consecutif*, and which has been by almost all surgeons acknowledged as a luxation under the title of *Luxation from an Internal Cause*. Often the bones, thus eroded, become carious, and not unfrequently hectic ensues, and the patient dies.

If, escaping all those dangers, the patient live, and the bones granulate, they unite with each other; for the persevering posture of the patient prevents the process of ossification being disturbed, more effectually than our most severe and curious bandages could do; the bones unite with each other often in the most awkward direction, the thigh-bone being fixed and united with the pelvis at right angles in respect to the body.

#### SECTION IV.

*Of the scrophulous Disease of Boys, or the Disease of the Bones which compose the Hip-Joint.*

The scrophulous disease of this joint is peculiarly frequent in



boys from five to eighteen or twenty years of age, and is of that insidious nature, that its approach is hardly observed; the disease is established before its symptoms are noticed, even by the most affectionate and attentive parents, and it ends in total caries of the joint, with ankylosis or cohesion of the diseased bones, though often, from the suppurations and dreadful pain, hectic and death prevent this imperfect cure. The bones, and not the soft parts, are the seat of the disease, therefore its progress is very slow; the pain is so dull, that the boy walks and runs about for months after the disease is formed. The parents first observe an awkwardness and trailing of the affected limb, as if it were weakly; the boy complains little, except of weariness after play, and of that numbness and stupor, with dull and heavy pain, which the parents mistake for growing pains, so frequent in boys.

The boy now begins to stand always on the sound limb, and in such a posture, that the parents chide him for awkward habits. After sitting a little while, his joint stiffens; when he returns to play, he begins to feel pain; when he is warmed by exercise, the joint moves more easily, and he runs his race with his play-fellows; but when his bout of exercise is over, he falls again into a state of languor. The limb seems weakly, and begins to waste, the boy loses his health and complexion, from day to day he complains more and more of pain, till at last he is confined, and a puffy swelling appears about the joint.

During all this stage of the disease, the bone is swelling and becoming more vascular, the lining of the acetabulum, and the periosteum covering the head of the thigh-bone, are thickened in common with the bones themselves, which are now swelled. The head of the thigh-bone is protruded in some degree from its socket, just as a diseased tooth is protruded from its socket by a bag of suppuration forming under its fangs. Still the disease is limited to the bones; there is not, as in the disease arising from bruises of the acetabulum, excruciating acute pain; although the leg be remarkably elongated, so as to straddle away from the body, though it be so elongated that when the boy stands on the diseased leg, the toes only of the sound one touch the ground, yet he is almost without pain, and walks with a degree of ease: exercise, or the common degree of motion, during this stage, is not so difficult on account of pain, as imprudent, from its increasing that affection of the bones which unhappily is too late of declaring itself by acute pain.

But at last the stage of acute pain does come; the boy becomes unable to move; the pain becomes very acute; the soft parts which connect the bones begin to partake of the inflammation; there is redness now, as well as swelling, round the haunch.

The pain is often, though not always, excruciating; abscesses form round the joint; the matter bursts out, first at the groin, then at the hip; as the abscesses give vent to the matter, the torture is in some degree relieved, as one sinus or ulcer dries or closes up, another runs more plentifully, or new abscesses form. Then the cartilages are ulcerated, the matter which had distended the capsule is evacuated, and the swelling of the parts within the acetabulum, which had in some degree extruded the head of the bone from its socket, subsides, the head of the bone falls down again within its acetabulum; the limb, remarkably elongated at first, is shortened in this second or suppurative stage of the disease.

The cure of the disease is now to be looked for, or the patient's death. The patient, wasted with suppuration, and tortured night and day with excruciating pain, becomes greatly extenuated; he is reduced to skin and bone; he is pale, and cadaverous in the face, the nose is pinched, the eyes staring from their sockets, and the face altogether shrunk and shrivelled up with discontent and pain. Often, the suppuration and caries extending along the bones, the whole pelvis is affected, the discharge is profuse, and the child dies of hectic; but sometimes the matter ceases to flow, the high inflammation subsides, the bones begin to granulate within, like soft parts, (as they indeed are in the boy extremely vascular) and by perseverance in one uniform posture, the bones unite, a proper ankylosis is formed, smaller suppurations are occasionally observed and opened, till at last the bones, after successive fits of inflammation, are entirely united with each other. The thigh-bone is generally united with the haunch-bone at an angle more or less acute, according to the posture which the child had found the most easy; frequently it is found, when the boy begins to walk with his crutch, that the thigh protrudes forwards; sometimes it is in the natural direction of the body; but even then the limb hangs in air, it is extenuated by want of exercise and by disease; the diseased limb has been stationary in its growth for eighteen months or two years, while the other limb, and the rest of the body, has been growing; thence the affected limb is always shortened, and often useless.

This is plainly a disease, and a slow disease of the bones; it is a disease of boys, because in them the bones are but forming; it is a disease of scrophulous boys, because in that state of the system ossification is a slow and imperfect process; it is a disease most frequent in the bones of the great joints, because they are large, and are, till the twentieth year, very imperfectly formed.

In this disease the pains are dull, because the bone is insensi-

ble; slow, because the firm system of a bone does not easily enter into disease; the elongation of the joint is a sure sign that the disease is established, and the head of the bone, the socket and the soft parts beginning to swell, the excruciating pain demonstrates that the soft parts are fully inflamed and ulcerated, and that to the original disease of the bone is now added a disease of the surfaces, such as takes place after the bruise of the acetabulum; and finally, the shortening of the limb intimates to us that the bones are wasting, which is often confirmed by small fragments and scales of bone coming away along with the matter. Finally, When the matter ceases to flow, the fistulas to close, the limb to shorten still more, and the pains to subside, then the bones come into actual contact, granulate, unite, and ankylose firmly in due time, for the hectic ceases, the appetite returns, and the cure goes on well, if only the patient can survive the degree of debility already incurred.

This final destruction of the joint is the ordinary issue of the disease, for where the bones are once thoroughly diseased, they are in general carious, or in other terms, dead, or (as we should say of soft parts) gangrenous to some extent. The carious part then must be separated; the bones which enter so slowly into disease, must of course recover slowly; but besides the extent of surface, the disease is attended in its first stage with so little pain, the patient walks so long while the disease is forming, and the joint bears so entirely the whole weight of the body, that being once diseased it cannot easily recover; it is indeed entirely ruined in its structure almost before the disease is observed.

The cure in the bruise of the acetabulum is leeches, fomentations, blisters, general bleeding, and perfect quiet; but in this scrophulous disease of boys, the cure is best conducted by cold bathing, generous food, wine, and whatever will contribute to the restoration of the health and strength. The immediate progress of the disease is best antagonized by the counter irritation of blisters, or rather of deep and large issues upon the hip, or by the application of cauterics (the oldest and perhaps the best method of cure) along with prudent openings, and careful, but unofficious surgery. But the object of chief importance in promoting the ankylosis, is to prevent motion, for even the weight of the limb is very painful, the very turning in bed inflames the part and interrupts the process; and quacks, by turning and twisting joints during this process (the patient being in a fair way of being cured) have caused death.

When the period of ulceration, granulation, and healing of the bones arrives, a remarkable, but very gradual, shortening of the limb takes place, because the bones must first be ulcerat-



ed, then fall into closer contact. then granulate, and then adhere, before the ankylosis is complete. During the whole of this process the parts are wasting, coming closer and uniting: at least it most generally is so. I observe in ankylosis, even of the knee-joint, where the bones are flat, and the cartilages remarkably thin, that there is a very remarkable shortening of the limb.

When such a suppuration and caries, beginning in the bones themselves, does happen, not in boys, but in adults, not from any constitutional disease, but from a blow, the blow is in a very particular direction, and affects only the bone; for it is not a blow upon the trochanter striking the head of the bone downwards, so as to bruise the soft parts at the bottom of the acetabulum; but it is by a person making a desperate leap and lighting fair upon the feet, for the head of the thigh-bone is then struck upwards against the deepest part of the acetabulum, where the Os Iliolum is particularly large and firm; the bone only is bruised, there is no immediate pain, the lameness comes on slowly, the disease usually makes that slow progress which is described in the case related in the foot note from the Posthumous Works of Justamond.\*

\* A woman about eight and twenty years of age, laden with a basket full of bottles, having jumped down a few stairs in going into a cellar, preserved the centre of gravity of the upper parts upon the left thigh and leg so well, that she kept herself from falling; but she experienced, in the inside of the joint of the hip, a violent shock, which was, however, attended only with a very bearable degree of pain, since she was able to continue her ordinary work for more than a fortnight, without complaining. But she still felt, in walking, a pain which gradually increased, from the continual exercise she was obliged to use in her capacity of servant: the difficulty of motion increased with the pain; and both the one and the other, three months after the accident, were grown so much worse, that the woman was no longer able to support herself upon that limb. At this period she came into the hospital where I attended; different embrocations were used to the upper part of the thigh, but without any effect; resolute, anodyne, and maturing cataplasms, were then applied, because a tumour manifested itself at the upper posterior, and external part of the thigh, which seemed tending to suppuration. A fever came on; and when the abscess became evident, all the openings and counter-openings were made, which the sinuses the pus had formed, required; the matter which came out, had no kind of offensive smell: it brought away along with it some small bony particles, and an oleaginous fluid floated on the surface; the incisions were lengthened as much as it was thought necessary, setons were passed, and during the course of the treatment, vulnerary and deterfive injections were tried, such as were imagined to be best suited to the state of the parts. At different intervals small portions of bone came away, separated either from the head of the thigh-bone, or from the cavity of the joint, into which several of the sinuses penetrated. A slow fever and a marasmus, which is its usual attendant, destroyed the patient between three and four months after her admission into the hospital. Upon examining the seat of the disease, I found the capsular ligament almost destroyed, the round ligament totally consumed, the head of the thigh-bone carious in all its surface, and even to a considerable depth in its centre; the cavity of the joint was also attacked with caries throughout its whole extent; and lastly, its cartilaginous border was completely destroyed.



## CONCLUSION.

A slight and easy pathology of these various accidents, and an accurate diagnosis, is all that I have aimed at in this discourse; nor do I know of any subject in surgery which so well merits a careful recapitulation. The disorders which need to be distinguished from each other are, fracture, luxation, bruise of the acetabulum, and the scrophulous disease of boys, seated unquestionably in the bones; and the chief signs are, the length of the limb, the direction of the toe, the place of the trochanter, the elongation or shortening of the limb, and the manner in which it turns, when moved by the surgeon.

First, We are assured that the thigh-bone is luxated downwards, when the accident has been a twist of the limb, or a blow upon the very top of the great trochanter; when the thigh is elongated three inches or more; the toe turned outwards, in a splay-foot posture, and kept straddling away from the body with great pain. This luxation is accompanied with a proportioned displacement of the great trochanter; the hip is flattened, and in lean people you can distinguish the head of the bone rolling in the groin, though not in fat subjects, nor in women whose pelvis is broad and flat.

Secondly, We distinguish luxation upwards by the remarkable shortening of the limb, by the ham being crooked, the knee of the luxated side turned close in under the thigh of the sound side, and the toe turned inwards, or almost backwards. The great trochanter rises very high, and the thigh is flattened in this case, as much as the hip is in the last mentioned. The patient lies on his sound side, almost on his face, and when you take hold on the leg which stands up, and begin to turn it, you, by laying your hand over the most tumid part of the haunch, feel first (because it is the most prominent point) the rolling of the trochanter, and then by carefully examining and turning the thigh-bone, you at last distinguish the head of the bone.

Thirdly, When the neck of the thigh-bone is fractured, the limb is remarkably shortened, the trochanter is higher than its natural place, the thigh is flattened, the pain is exquisite, and the general appearance is that of a thigh-bone luxated upwards; but the moment you take the limb in your hand, you distinguish this from all other accidents; for while the limb is so remarkably shortened as to leave no doubt of some very essential injury having happened, it yet turns so easily as to prove that it is not luxated, and indeed it turns so loosely as to prove that the limb has not that degree of steadiness which the natural connexion of the shaft of the thigh-bone, with its head and neck, should give.

The limb is shortened, but is easily lengthened; the toe is turned out, but is easily turned in again; in short, the manner in which it moves will satisfy you at once that the shaft is separated from the head of the bone. If crepitation be not among the immediate signs of this fracture, it is because the bones are not, as in other fractures, opposed to each other; if crepitation be felt afterwards, it is only when the limb is extended, and the bone set, or in other terms, the broken parts regularly opposed to each other.

Fourthly, When the patient has fallen upon the trochanter, or received a blow, when the head of the bone has been struck down into the socket with violent pain, when the patient becomes instantly lame, and lies in a crooked posture, with the knee of the injured limb bent in under that of the sound, (in order to raise up the head, as much as possible, from the inflamed socket where its pressure occasions pain) when, along with these appearances, we are perfectly sensible that the limb, though crooked, is not shortened, when we find, that though when moving it occasions dreadful pain, yet it does move easily and steadily, we may be assured that the fall has occasioned merely a bruise in the acetabulum. In this case the patient lies crooked in bed, the pain is exquisite, the patient cannot bear to have the joint touched, or the limb moved, the slightest motion is terrible to him, to stretch out the limb is excruciating. The surgeon has not leave to handle the limb freely, or is prevented by his own timidity, and by the shrieks of the patient; he mistakes the nature of the injury, makes cruel attempts to reduce a bone which is neither fractured nor luxated, and does essential injury to a joint already much injured; perhaps he never doubts of the limb being luxated or fractured, till, after some months of the severest misery, the pain remits, the patient begins to walk, and recovers at last the use of his limb.

This mere bruise of the acetabulum is unquestionably the disease which Petit describes, where he says that he has often prevented it coming to any height by applying astringent solutions, and defensives made of alum, and whites of eggs, with spirits of wine. Rest is of chief service, but rest need hardly be recommended to one in such exquisite torture, whose pains are aggravated by the slightest motion.

Fifthly, When a scrophulous boy, under eighteen years of age, has laboured long under a disease of this joint, where there is great lameness, little pain, a puffy swelling, an elongation of the limb, if there come at last acute pain, hectic fever, symptoms of internal suppuration, and at last an abscess upon the hip or groin, you know that it is a constitutional disease, that it is seated in the bones, that it is analogous to the white

swelling of the knee, or curvature of the spine ; but unlike the disease of the knee-joint, this of the hip cannot be amputated, and the boy must go through the fiery ordeal, and often dies from fever and irritation, great profusion of matter, and caries of the bones. If he survive, it is usually with a limb emaciated; crooked, hanging in air, and fixed by the anchylosis of the femur with the haunch-bone. The chief cause of such disease is the scrophulous condition of the system, the imperfect ossification of the bones, the great extent of diseased surface, and from the occasional shocks which this great joint suffers, in consequence of its supporting continually the whole weight of the body. The chief danger of the disease is the boy feeling but too little pain to make himself or his parents sensible of the danger ; if it be not chiefly in consequence of the pressure and motion that such disease goes on to the last stage of caries, yet certain it is, that under the pressure of the whole weight of the body such a disease cannot be cured ; the only chance, then, of recovery, is from wine, generous diet, cold bathing, caustics, issues, and absolute rest.

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## DISCOURSE XIII.

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### OF LITHOTOMY.

#### *Preliminary Observations.*

OF all the operations of surgery, lithotomy is that in which the true principles of the operation may be most safely deduced from the anatomy of the parts. To conjecture *à priori*, which form of incision would be attended with fewest dangers, would not be difficult ; but now that we have before us such a suit of experiments, performed in various countries by the greatest masters in surgery, and accompanied with such authentic records of their various successes, we are able, from experience as well as theory, to resolve that important problem ; “ How we may, with least danger, open our way into the bladder, for the extraction of the stone.” And the universal adoption of the lateral operation invented by Chesselden, sufficiently attests its superiority to all others.

Accustomed with teaching, I have had occasion to observe that the mind of the surgeon is ill at ease, who has to perform an operation for which he has no theory ; he must operate with little decision who merely imitates the motions of others.

I have also observed that, to perform an operation like this

with an intrepid spirit and steady hand, the mind of the young surgeon must be composed; he must have an entire and perfect confidence in his own knowledge; he must be familiar with the structure of the parts; he must see them exposed in every variety of posture, and must have their relations to each other explained; he must dissect them often, to make this knowledge familiar, and to acquire dexterity and address, for no operation in surgery can be so properly defined a *dissection* performed on the living body as this. While the young surgeon studies the connections and relations of these parts, he must also be instructed in all the accidents which may occur; he must be taught to foresee every possible difficulty, that he may not in the midst of an operation be overcome with the sudden apprehension of some interruption which he does not understand. The teacher who is to describe so eventful an operation as this of lithotomy, must first explain in detail, circumstantially and separately, each important movement of the hand or instruments, and every precaution with which each is to be accomplished; and then close his lesson with such a rapid enumeration and description of the successive acts, as will leave a vivid impression on the mind of the young surgeon of the manner in which he is to proceed. This last description should serve him as a dramatic picture of what he is to perform, which he may look upon anew every time he has to operate.

Before I proceed to describe the several stages of the operation of lithotomy, there are some preliminary points to be explained, which relate not to the dress of the patient, nor the height of the table, but to the main design of the operation, and especially to the posture of those very moveable parts, the rectum and bladder, with regard to each other, and the manner in which the surgeon should feel and ascertain every thing that is interesting to him. The kind and degree of distress which your patient suffers, will enable you to guess at the state of the parts; in a boy who cannot have passed many years in this condition, whose parents, from observing his pulling out the penis and pressing the thighs, and crying when passing the urine, can ascertain both the duration of his complaints, and the degree in which his health is affected, you are sure of every thing favourable for your operation; for boys are naturally healthy; the stone has not with them time to acquire any uncommon size, it usually is small like a gall-nut, and very rough and irregular on its surface; the bladder is not contracted nor ulcerated; you can feel the stone with the fingers, in the rectum, and press it forward so as to make it prominent in the perinæum; in a healthy boy, with a small stone recently formed, you undertake the operation with confidence. In an adult, who retains much



urine, who, though the symptoms of stone are decisive, yet passes long intervals with little pain, in whose urine there is not great sediment of mucus, and seldom any blood, with whom the paroxysms of the disease, i. e. the temporary inflamed and irritated state of the bladder, is not frequent; the bladder is probably capacious, the stone small, and the state of the parts most favourable for operating. But the scene is sadly reversed when the patient, shrinking from the pains of the operation, has long endured the tortures of the stone: when he has endured this disorder for many years, he is pale, languid, and emaciated; the parts are unfavourable to the operation, and his constitution to recovery: he can retain but one or two ounces of urine: the bladder is, by its frequent contractions, thickened in its coats, and, its inner and most delicate surface being in almost continual contact with the stone, he feels excruciating pains in the gland penis every time he passes his urine: when he walks, he has a gravitating and dragging feeling, accompanied with tenesmus or diarrhœa, from the increasing size of the stone, by which his paroxysms of particular distress are frequently renewed; his urine is so mixed with mucus, that, of the quantity which he passes into a glass for our inspection, the urine being poured off, one half remains a pure white mucus, and each paroxysm of pain, especially if it arise from walking, is accompanied with a discharge of blood: the day he passes in almost unremitting torture, and, during the night, he is every half hour on his knees, straining to pass his urine with dreadful pain. In such a patient the bladder is small, contracted, subject to inflammation; from frequent paroxysms of the stone, the parts are in a state sometimes peculiarly disposed to inflammation, and never favourable to the operation, while the strength and constitution are exhausted by suffering and want of rest.

It is only when your patient is free from pain, when he has had a long interval after a paroxysm of pain, when he is free from irritation and fever, and in no danger from the infection of any reigning epidemic, that you can venture to perform the operation. You wait for the more favourable seasons of spring or autumn: you nourish and strengthen your patient, if exhausted, and prepare him so by opiates and the warm bath, as to ensure a favourable state of the skin and bowels. The season of any epidemic disease is much to be avoided. I have frequently, during the prevalence of influenza, or of dysenteric diseases, been cruelly disappointed in the adhesion of wounds, after common operations, in cases of the most simple incisions, as in the extirpation of a cancerous breast; but the inflammation, which merely prevents adhesion and retards the cure in common operations, produces in this, where the wound is so near the viscera, in abdominal inflammation and death.

And let me advise the surgeon to be slow in pronouncing his opinion, to be careful to ascertain the existence of the stone, by sounding, and to feel it also by introducing the fingers into the rectum, and to establish and authenticate his own opinion by a regular consultation, before he presume to operate. He should almost live with his patient for some days, for, unless he inquire carefully into his history, he cannot proceed with confidence, or his confidence may draw him into dreadful errors. The patient may have no stone, but an ulcerated and thickened bladder; he may have a stone, but too small to require so dreadful an operation, one which the patient might be able to engage in the urethra, and pass naturally by drinking floods of diluents, and passing the urine upon his knees; a small stone, being impelled by the force of the urine into the urethra, sometimes forms there a sac for itself, and the sound grating along this small calculus, in passing along the urethra, persuades the surgeon of the existence of a stone in the bladder: a patient has been unfortunately cut for a stone so small, that it has been swept out along the channel of the gorget with the flood of urine, and none been found to seize with the forceps; at other times a small calculus, of a cherry-stone size, has been found in the hinge of the forceps, and such accidents have been mentioned with as much indifference as if the surgeon were not responsible for the cruelty and folly of thrusting a gorget into the bladder of a patient whose stone was so small as to be passed by the urethra. In short, these are accidents which nothing but uncommon precaution, and a most faithful attention to the complaints, feelings, and whole history of the patient, can detect or prevent.

However distinctly the sound may plump upon the stone, and satisfy every one of its existence, the surgeon never is to omit introducing one or two fingers into the rectum; from this mode of inquiry, various circumstances may be discovered, and inestimable advantages arise to the surgeon, who, in place of imitating the motions of other operators, proceeds with intelligence and design. I hold this mode of examination to be little less important to the operator who cuts with the knife or gorget, than to him who cuts on the gripe: By introducing two fingers into the rectum he feels the staff distinctly, upon which he is to perform the most delicate part of his incision: he feels the position of the rectum, which he is to keep out of the way of his instruments: he distinguishes, through the walls of the rectum, the membranous part of the urethra, which is to be his aim if he cut with the gorget, and the prostrate gland, which he is to divide, if he cuts with the knife: he feels the manner in which the stone lies in the bladder, which, after his incisions,

he is to grasp with the forceps : if the stone be small, he may not feel it very distinctly ; but if it be large, it falls low towards the neck of the bladder, is easily felt, its very form may almost be distinguished, the staff being plainly felt passing under the stone, when large, and holding it in its bend or curvature. The surgeon, by occasional examinations, may almost estimate its size, and, if he do not expressly proportion his incision to its size, may at least avoid the error of making a great incision for a small stone, or the still greater danger of making a small incision when the stone is very large ; and when the stone is so large as to require to be broken by strong forceps, he may always be aware of the nature of the operation he is to perform. I remember to have been called to a consultation, in which the gentleman, who invited the consulting surgeons, wrote in these terms : “ To consult upon the case of a patient who has a stone in the urethra, and another in the bladder.” The patient, in fact, had laboured long under the disease, the stone had increased to an enormous size ; upon passing the sound, it encountered the stone almost before it had entered the bladder, so low was the stone depressed by its own weight, and the patient’s straining dilating in some degree the neck of the bladder and projecting into it. Upon examining by the rectum, I felt a stone nearly the size of the fist, and intreated the surgeon to have strong forceps in readiness to break it in case of difficulty. When we were met for the operation, I used the freedom of asking, “ Whether forceps were at hand to break the stone ? ” He said, “ No ; that he had sent for forceps, such as I wished, but could not easily procure them.” Then I said, “ Sir, if you value your own reputation, or your patient’s life, refrain from operating till you are better provided, which you may easily be to-morrow morning ; to perform this operation in the ordinary way, will be murder.” He turned about and proceeded with his operation : the scene which ensued was dreadful ; two or three forceps were successively twisted, or broken ; all present were in the most distressing perplexity. Mr. Wood bethought himself of a pair of large and strong forceps, which had lain as lumber among his apparatus ; these were sent for to his house, and with them the stone was extracted ; but the operator had never one moment retrained from labouring with one instrument or another ; the patient had struggled under his hands a full hour, in the most dreadful agonies ; I need hardly say, that in two days he died.

Not to break the stone, when of so uncommon a size, is cruel and dangerous, and no one accustomed with this operation will scruple to do so for fear of fragments of the stone remaining in the bladder, for he must be conscious that he seldom operates



without the forceps chipping off small fragments of the stone, which are more dangerous than the fragments of a stone designedly broken, as they are less observed.

The condition of the rectum and bladder should be an object of particular attention. The bowels must be emptied by a purge two days before operating, for fullness and irritation of the bowels, will dispose to abdominal inflammation. The rectum must be emptied by a clyster on the morning of the operation, lest the fullness of the gut should expose it to be wounded: This, if not a fatal, is yet a blundering wound, of which the surgeon should be much ashamed: although we have the best authority for affirming that the intestine may be wounded by the most dextrous operator. Chesselden acknowledged to Mr. Morand, that he had twice, in operating, wounded the rectum. As it is chiefly important to prevent the cutting edge of the gorget injuring the back part of the bladder, it is of the first importance, in operating with the gorget, to have the bladder full; the fullness of the bladder allows the staff to be turned easily to every side of the bladder, in feeling for the stone; it allows the surgeon to set the staff before cutting, in the precise direction he wishes to have it. The fullness of the bladder presents the fore part of its body, viz. that where the prostate surrounds it, fairly to the cutting edge of the gorget, and gives the bladder a steadiness to resist the push. This fullness of the bladder prevents the cutting gorget being driven through the fundus among the bowels, and the quantity of urine running off freely along the channel or hollow of the gorget indicates to the operator, that this, the most dangerous movement in the operation, is properly performed. The patient for this end must retain his urine four or five hours in the morning of operation; in boys, and even in men, a linen rag must be tied round the penis to prevent the urine flowing off. The string must not be undone upon introducing the staff for operation, for the body of the penis is so compressible, that the staff passes as easily when the string is left, as when it is taken away. I have often been provoked to see the string taken off, the staff introduced, and the whole of the urine allowed to run off by the groove of the staff, in the very moment in which the surgeon is about to drive his gorget into the bladder.

As one great purpose of many things which the surgeon does immediately previous to the operation, is to ascertain the relative posture of the parts, and revive his own recollections of the several points, he should never fail to introduce the staff himself, though often this is committed to the assistant. May not an unskilful assistant drive the point of the staff through the membranous part of the urethra, and lodge it between the



rectum and bladder, where, of course, the gorget when driven along will follow the groove? Is it not a satisfaction to the surgeon to pass the staff himself, that he may do it gently without irritating the parts; that he may feel and distinguish any rub from any small calculus, sticking in the urethra; that he may lodge fairly in the bladder that grooved directory, which is to guide the most important stroke of his knife; that he may plump his staff against the stone, and feel it distinctly before he operates; that he may, after introducing the staff, pass his finger into the rectum, feel how the staff lies, incline the handle of it to the right groin, and so protrude the heel in the perinæum where he is to cut? Will not the introducing and setting the staff and feeling its curvature, both in the perinæum and from within, give the operator more decision, and a more distinct recollection of what he has next to perform? To deliver the staff to the assistant, that he may introduce it, is a slovenly, a timid, or an evasive practice; I have seen this often done, but it always seemed to me that the man who dared to undertake the operation of lithotomy, was doubtful whether he could introduce a staff; or that he was so jealous of his reputation as a rapid operator, that he would not allow the more ignorant of the attendants to calculate the operation as begun, when he was only introducing the staff; or perhaps he feared lest his hand should be unsteadied by some slight opposition to the introduction of the staff; a part of the operation which should, in fact, by reminding him of all the important relations of the parts, inspire him with steadiness and manly resolution.

There is a gradation in the length and curvature of the instruments which are on various occasions to be introduced into the bladder. The CATHETER, as it needs not enter far into the neck of the bladder, though it should always be as big as the urethra will easily admit, should not be long, and should have a very gentle and simple curve: the SOUND, with which we feel for the stone, must be round, smooth, longer, and more curved; but it must not be very long, nor much curved, lest it do not turn easily from side to side in the bladder; and it should be introduced when the bladder is moderately full, that it may be turned easily in various directions in search of the stone, which, if it be not found when the bladder is full, or the patient seated, or lying on the ground, may perhaps be felt after he has been permitted to empty the bladder, or allowed to stand up. The staff along which the surgeon designs to run the gorget, should have a prominent heel, that it may be easily felt through the membranous part of the urethra; it should have a wide groove, but should not be protracted into a beak, lest it should

hold the knob of the gorget too long engaged in the groove, and carry it so deep as to endanger the fundus of the bladder.

The posture in which the patient is bound, is horrible, most oppressive, but yet it is essential to the performing of an operation, where the slipping of one instrument, or the misgiving of one stroke of the knife, makes the difference,—of safety or death. He must be made to grasp his feet with his hands, and secured in that posture by strong garters, encircling the wrists and ankles, and thus, bended into a curve, he rests almost upon one point of the spine, and is brought so near to the edge of the table, that he is almost suspended in air, by the two lateral assistants, who support each a foot and arm. Unless the patient is brought thus far over the edge of the table, supported by the assistants, and his breech bolstered up by a pillow; unless his breech project over the edge of the table; unless the perinæum be turned almost directly upwards, and the surgeon seated low, and rather under his patient, he cannot pursue his incision so far beyond the tuber ischii as he should do, in order to cut the transverse muscle, for the incision should pass the curvature of the hip.

The patient should be brought out for operation, dressed in a loose gown, stockings, and slippers: his neck-cloth should be loosened, or a light silk handkerchief put about in place of it: three medical assistants should support him, one on each side should hold, each, a leg and wrist, supporting the sole of the foot in the hollow of one hand; the third assistant should support his head and shoulders, and keep him forward according to the operator's directions. The table should be big, firm, and steady, covered with a folded blanket, with one or two small pillows placed for the head to rest upon, and one longer and bigger to support the breech, or rather the loins; a little sand should be strewed under the lower end of the table. A friend should stand by to speak to him, to encourage and support him, and to give him occasionally a little wine and water; and, as no unseemly confusion should be allowed, every thing on the table of instruments should be fairly arranged, and every attendant steady, silent, and observing. One only should hand the instruments; while the assistant-surgeon, taking his place behind the young man who supports the right foot, waits there till the surgeon, having introduced the staff, and felt and placed it, lays it down towards the right groin, and gives it to him in charge; when he is to grasp it firmly and hold it steady with his right hand, but without pressing hard, supporting the testicles and scrotum with the flat palm of his left hand, and pulling slightly upon them so as to stretch the perinæum, and make it tense for the incision.

Upon the table are placed, a decanter of wine, another of cold water, and a large glass of cool wine and water, which may be poured into a small tea-pot, as more convenient for the patient in the awkward posture in which he lies; a basin of warm water, with the forceps and scoops in it; and in this basin of water the surgeon heats the staff with which he chooses to operate. The staff he chooses, and the gorget suited to the size of the patient, and well and smoothly fitted to the groove of the staff, and the knife with which he is to cut, are laid on a plate upon a fine cloth or towel. These instruments lie on the plate; the staffs and forceps and scoops are placed in the basin of hot water; the sponge, for wiping the wound, in another basin of warm water: the needles, the lint, the dry sponges, or agaric, to be used in cases of unusual hæmorrhagy, together with the canula, round which the sponge or lint is to be wrapped in case it should be necessary to thrust a canula into the wound, lie behind the basins and apart; and along with these is to be laid, in another basin of warm water, a strong syringe, or a large glyster bag and pipe, for washing out any small calculi or fragments of a broken stone. When the surgeon, advancing to the table, thus arranged, warms the gorget, and then sticks it in his girdle or apron string; warms the staff and oils it, with the purpose of introducing it; twists a towel into his girdle, for it is impossible to perform the several parts of an operation neatly, with soiled hands; and leaves upon the plate only the incision-knife, which his assistant hands him, upon receiving the sign; and sometimes also the gorget is left to be handed by the assistant.

The operation of lithotomy, as performed with the gorget, may be divided into these stages: 1st, The external incision, by which we divide the skin and the transverse muscle of the perinæum: 2dly, The internal dissection, by which we divide the fat and cellular substance, and the fibres of the levator ani muscle, and open the urethra: 3dly, The settling of the gorget in the groove of the staff, and pushing it onwards through the prostrate gland: 4thly, The introducing the forceps, withdrawing the gorget, and grasping and extracting the stone.

## SECTION II.

### *Of the External Incision.*

The general belief and the common description stands thus: "That you are to make your staff protrude in the perinæum, and to perform your external incision, by cutting upon the staff."



Nothing is more untrue\*; we cut far from the staff: and this unfortunate description occasions infinite perplexity to the young surgeon, who, in setting his staff, cannot cause it to be felt in that place where he must perform his incision, and who, having made his incision, and penetrated to a considerable depth without feeling the staff, continues in confusion and dismay.

The external incision relates not at all to the neck of the bladder, nor is it made upon the curve of the staff; it relates to the great hollow betwixt the rectum and tuber ischii; it is designed merely to open the way into this hollow, through which the stone is to be extracted; and the surgeon's chief care must be, after cutting through the skin and fat, to divide the transversalis perinæi muscle, and all the ligamentous fibres, which would, if left undivided, oppose the extraction of the stone. The incision begins at that point, an inch below the scrotum, where the heel of the staff is felt, and, departing from that point and leaving the direction of the staff, it passes over the great hollow in a line betwixt the anus and tuber ischii; the incision is performed in the following manner:—The surgeon seats himself on a low stool; the assistant draws the testicles upwards, to make the perinæum tense, and gives a slight pressure to the staff; the operator then lays his left hand flat over the right buttock of the patient, so that the palm of the hand lies upon the tuber ischii; spreads out his fingers upon the perinæum, as in the posture of displaying a ring; by pressing first two or three times with the point of the fore-finger at the root of the scrotum, he feels the heel of the staff; and then, by drawing the skin of the perinæum towards the left side with the points of the fingers, he makes the lurk betwixt the perinæum and the hip, even. Then, taking the knife (which sometimes, while stretching the perinæum, the surgeon holds in his mouth) in his right hand, he holds it lightly like a writing-pen, with the points of the thumb and three fingers; begins the incision about an inch (in a big man) behind the scrotum, and carries it downwards, declining regularly towards the hip, till it terminates apparently upon the hip, for though the incision is carried regularly in the middle betwixt the anus and tuber ischii, yet, the skin being tenser to the side of the tuber ischii, the wound seems to decline towards that side. The extent of the wound being ascertained and marked out by this first stroke of the knife, three inches and a half in length, more or less, according to the bulk of the patient, or the size of the stone; this incision beginning behind the scrotum, proceeding obliquely towards the hip, running in the middle betwixt

\* Most surgeons whom I have seen operate, make the incision in this manner, cutting consequently through the corpus spongiosum penis, nor have I seen any ill consequences from it. S.



the anus and tuber ischii, or holding off but a little from the anus for fear of wounding the rectum, will be found to have its centre nearly opposite to the anus; and if the whole length of the incision be three inches and a half, two inches of its length will lie before the anus, and one inch and a half behind. The fingers of the left hand, which at first kept the skin tense, are now withdrawn for a better use. The fore-finger now guides the knife, and the operator proceeds to dissect through fat and cellular substance, and muscular and ligamentous fibres, till the wound is free and open, till all sense of stricture is gone; for it is only by feeling opposition and stricture that we recognize the transverse muscle. When this hollow is fairly laid open, the external incision, *which relates merely to the free extraction of the stone, is completed*; and the operator begins to feel for the staff.

## SECTION III.

*Of Cutting the Urethra.*

The incision thus made is into the hollow of the pelvis below the place of the staff, which is to be felt only in the upper angle of the wound. If it were his design to operate only with the knife, the surgeon would now push his fingers deep into the wound, and, by the help of the fore-finger, dissect from the urethra along the body of the gland, till he distinguished its thickness and solidity, and reached the back part of the gland; then plunging his knife through the back of the gland, and settling it in the groove of the staff, he would draw it firmly and steadily towards him, pressing the knife steadily into the groove of the staff, and then, the free discharge of the urine assuring him that the gland and cervix vesicæ were divided, he would lay aside his knife, pass the left fore-finger into the bladder, withdraw the staff, and introduce the forceps.

But in operating with the gorget, the next business after the outward incision, is to seek out, not the body of the prostrate gland, but the membranous part of the urethra; to find it, the operator turns his fore-finger towards the upper angle of the wound; feels for the staff close under the pubis, where it lies close upon the bone, hardly to be distinguished from it; and as the operator recognizes the transversalis muscle only by the feeling of resistance, he recognizes the membranous part of the urethra only by the nakedness of the staff. But it is safest to be very clear, to dissect fairly to the staff, to feel not merely the membranous part of the urethra, but the body of the gland. In this stage of the dissection you can do no harm; a fair dis-

section may save you the disgrace and danger of making three or four unsuccessful cuts at the urethra; you therefore keep pressing down the rectum, with the mid-finger a little crooked; with the fore-finger pointed nearly upwards, you guide the knife in dissecting along the naked part of the staff, and the body of the gland; and when all is fair, and you are prepared to strike into the urethra, you place your fore-finger upon the apex or point of the prostrate gland; and turning the edge of your scalpel upwards, you strike it firmly through the urethra into the groove of the staff, and draw it towards you, steadily, along the groove, till you have made an opening such as you cannot miss, about half an inch in length, into which you fix the nail of your left fore-finger, or of your thumb, and prepare to introduce the gorget.\*

## SECTION IV.

*Of introducing the Gorget.*

Keeping his thumb-nail firmly fixed in the groove, the surgeon gives away the knife, and lifts the gorget; poises it, and then holds it firmly in his hand. He then passes the gorget into the wound, where it enters pretty deep before it reaches the staff; then, pointing the beak of the gorget to the groove of the staff, he lodges it fairly in the groove, and running it once or twice backwards and forwards to be sure that all is fair, and holding the gorget steady with the right hand, and reaching the left hand over the pubis to receive the staff from his assistant, he lays hold of the handle of the staff, holds it steady for a moment, then, moving the gorget with the right hand, feels by the left whether the beak runs fairly and smoothly in the groove; then, the two hands acting in concert with each other, the operator balances the staff and gorget, and by making the two hands feel each other, prepares them for co-operating in the most critical moment of driving in the gorget; and when all is prepared for driving home the gorget into the bladder, the surgeon depresses the handle of the staff, so as to carry the point of it deep into the cavity of the bladder; his staff stands, at this moment, at right angles with the patient's body; he rises from his seat, stands over the patient, for an instant of time, balancing the staff and gorget once more, and, feeling once

\* I intreat those who are not perfectly confident, to make their incision of the urethra more than half an inch in length; an incision of half an inch in length is just sufficient to be distinctly felt, and to allow the beak of the gorget to be fairly introduced; but it is an incision which a surgeon unaccustomed with operation might lose and fall into confusion. I advise him rather to slit up nearly the whole length of the membranous part of the urethra, when his incision will be nearly an inch in length.

more that the beak is fairly in the groove, he runs it home into the bladder, pointing it rather upwards, than directly backwards: then the urine gushes out; the beak of the gorget goes off from the point of the staff with an audible cluck, and the operator withdraws the staff with the left hand, as the conclusion of that movement with which he drives in the gorget with the right.

*Of extracting the Stone.*

The moment the gorget is driven home, as it always is, up to the hilt, (the thumb of the operator, which lies upon the gorge of the instrument, being actually within the wound,) the fundus of the bladder is in danger,—for the horrid and unnatural feeling of being thus impaled excites the patient to press downwards, as in passing the fæces and urine; the bowels are forced down upon the bladder; the fundus of the bladder is forced, by this pressure from above, and its own natural contractions, upon the edge of the instrument; matters stand now in a very dangerous condition, and the best means of preventing harm, is to introduce the forceps quickly! no time should be lost in the foolish ceremony of introducing the fore-finger to feel for the stone! Those who use only the knife, use the finger as a conductor for the forceps; but those who use the gorget as a conductor for the forceps cannot feel the stone with the finger, for it lies under the gorget, and the gorget exceeds the length of two fingers.

The moment the gorget is thrust home, the operator withdraws the staff, and gives it away; takes the handle of the gorget with the left hand, and the forceps in the right; the chops of the forceps being close, he passes them along the channel of the gorget, and the moment the right hand has introduced the forceps, the left hand withdraws the gorget. Then the operator, taking the handles of the forceps, one in each hand, begins to feel for the stone; the forceps must, by passing along the gorget, inevitably pass over the stone; let him, therefore, taking the two handles of the forceps, one in each hand, stand high above his patient, point his forceps downwards towards the bottom of the pelvis, to that sac or bulging of the bladder, in which the stone usually lies, and there he, in nine of ten cases, will encounter the stone; if he feels it with the forceps and cannot seize it, it is because he has passed over it, and touches it only with the lower side of one of the chops. When he feels that, he presses the stone with the point of the forceps, he then opens the blades with both hands, grasps the stone, tries the hold he has of it in a way which it is impossible to describe,

then, by grasping very firmly with the right hand at the extremity of the handles, he holds the stone firm, and by laying the left hand on the forceps, and holding with it also, he assists the right. confirms the hold, and prevents at the same time (by slipping his left fore-finger into the hinge) any undue pressure, such as a soft stone will not easily bear. Having thus fixed his hands, he begins to pull; and if the stone be small and the incision free, it comes easily and smoothly along. But I have observed that the young surgeon, when he feels the slightest opposition, expects to succeed by turning, twisting, and every kind of unmeaning violence, and has no absolute rule for a stage of the operation, which should yet be performed with an intention and manner as determined as any other. If the surgeon holds firmly and pulls in one uniform direction, though he had the strength of a Cyclops, he could not succeed; if he turns and twists his forceps from side to side, “*this way and that way, çà-et-là*,” as if he were dilating, not extracting, according to the directions of Paræus, since he is pulling without any design, he still has but little chance to succeed. If he will but reflect on the operation of the forceps, that the forceps are two levers with which he is to act alternately, depressing first one side of the stone, then the other, he will not scruple to adopt that decisive manner in extracting, which, though it seems harsh, is really easy, and relieves his patient the most speedily, and with the least violence. Let him, after having seized the stone fairly, press the handles of his forceps first down, then raise them up, then depress them again, with a wide and free motion, and he will be sensible, that by this slow and equable motion, the parts are little bruised by the cheeks of the forceps, and the stone will be, in a few strokes, brought to the mouth of the wound, and turned out, by one wide but gentle movement, into the left hand of the surgeon, which is held with the palm upwards ready to receive it.\*

## SECTION V.

*Of the causes of the Slipping of the Gorget.*

It will be easily perceived that the critical movement on which the fate of the patient depends, is, the cutting the urethra, the lodging the beak of the gorget in the groove of the staff, and the driving home the gorget. In attending operations, I have observed, in this moment, such a degree of hesi-

\* If the stone be large, it will be obstructed by the arch of the pubis, unless the operator press downwards towards the rectum: this must be particularly attended to in women. S.



tation and evident alarm on the part of the operator, as convinces me that it is a most important duty to explain the various causes of the gorget slipping off from the groove of the staff: he will best guard this accident, who is aware of every possible cause: it proceeds, like every important error, from want of knowledge in anatomy: since we often see the surgeon seeking the femoral artery for an hour, to tie it in a sound thigh, (the aneurism being in the ham,) we need not wonder if such an executioner mangle the urethra in attempting to perform lithotomy, and conclude with thrusting his gorget betwixt the bladder and the rectum.

1st, It sometimes happens, that the surgeon, deceived by the common description, and expecting to cut his incisions fairly upon the bend of the staff, goes deep into the hollow of the pelvis, and yet, after much dissection, feels no staff; falling then into confusion, and anxious to be relieved from this distressing scene, he begins to believe that he must *somehow* have cut the urethra, and, believing this, he at a venture thrusts in his gorget: sometimes the surgeon, having felt the staff, and distinguished the membranous part of the urethra, and turned up the knife, cuts into the groove with so tremulous a hand that he hardly wounds it; and having failed to dissect the urethra naked, before making this incision, the fibres of the levator-ani muscle close upon the small slit which he had made in it, and thus, after feeling distinctly the groove of the staff, he loses it again, and his gorget passes betwixt the bladder and the rectum.

2dly, Confusion and alarm, in the simple business of cutting the urethra, is a sure indication that the surgeon is in danger of doing something very terrible. Often you will observe the surgeon, in place of turning up his knife at once, and striking it steadily and firmly into the groove of the staff, lay down the knife, and lift it alternately several times; first he believes that he has cut the urethra, and then again becomes sensible, either that he has not cut it, or that he has lost the small slit that he had made. I have seen the operator give away the knife, receive the gorget from the assistant, point it at the groove of the staff, and try to introduce it, resume the knife, and make new incisions in the urethra, five or six successive times. I have seen the gorget driven twice, not into the bladder, but deep among the bowels, for although there was a stone, the surgeon never reached the bladder, never one drop of urine flowed, the stone was not extracted, and the boy died; this last mistake is mere butchery; the first is little short of it, for if every time that the surgeon resumes the knife, he has lost his first incision and makes a new opening in the ure-

thra, if every time that he loses one incision, the urethra has turned in some slight degree upon the staff, before he makes another, the successive incisions will almost entirely separate the urethra from the bladder, and the slightest push of the gorget will drive off the gland from the urethra.

3dly, There is much too in the direction in which the gorget is driven forward, for though the urethra be fairly cut, yet the angle at which the staff is held, or manner in which the beak of the gorget is laid to the groove of the staff, may disappoint the surgeon of his purpose, and make the gorget shoot past the bladder or push off the gland from the urethra. If the handle of the staff be too much depressed, so as to turn its point high up towards the fundus of the bladder, while the gorget is pointed too low towards the rectum, the gorget, in place of entering smoothly, will start off from the staff: or if, on the other hand, the handle of the staff be held too high, is too near the groin, too much in its first position, and the gorget pointed much upwards, the directions of the groove and the beak of the gorget will not correspond; the cutting edge of the gorget will not be so directed as to cut its way forward; the beak will hitch against the point of the gland, and may, especially if the urethra be mangled, force off the neck of the bladder and prostate from the urethra.

4thly, The surgeon, in place of moving the gorget along the groove of the staff, sometimes allows both gorget and staff to go together deeper into the bladder, till they touch its fundus; sometimes the operator, by an awkwardness in the posture of the gorget, needs to use such force, that the gorget, when it starts through the first obstruction at the neck of the bladder, may, (especially in a contracted bladder) wound the fundus. Even the forceps, blunt as they are, may, by rudeness and ignorance, be driven through the fundus of the bladder, the stone escaping by the rent, where the forceps cannot follow it, into the cavity of the abdomen. Those who prefer the gorget, and regard it as the ultimate improvement of this operation, avow these facts. "I have more than once (says Earle) known a gorget, though passed in a right direction, pushed on so far and with such violence, as to go through the opposite side of the bladder."

5thly, If the staff be short and the assistant unskilful in the management of it, he may, after the surgeon has cut the urethra, allow the staff to recede from the bladder, and in thrusting it back, push its point not home again into the bladder, but out through the wound in the urethra! The staff being thus lodged betwixt the rectum and bladder, the gorget must follow it; the surgeon feels the groove of the staff quite naked, fixes

the beak of his gorget, and drives it home in the true direction, but no urine flows! upon introducing the forceps, he feels no stone! he is in the end, after much violence, obliged to put his patient to bed to die. Such an accident is recorded by Mr. Earle, it proves the dangers of this particular operation with the gorget, and the superiority of that with the knife; the plunge of the gorget, to those who know to operate only with the gorget, is irremediable, but a surgeon perfectly acquainted with the parts, and skilled in dissection, would, in such a case, introduce his finger, feel for the prostate, strike his knife into it, and, putting in his finger, guide the forceps into the bladder, and at least extract the stone, if not save the patient. Chesselden once performed this, when another operator had failed, and pushed his instruments betwixt the bladder and rectum.

6thly, Though the gorget has passed right, the forceps may be directed wrong, for after a first attempt at extraction, and when the forceps have slipped, the scoop or finger are introduced, and the forceps re-entered; but, the opening which the gorget makes does not very easily admit the forceps, even when the gorget lies in the wound, to guide them; after the gorget is withdrawn, the forceps enter with greater difficulty, they slip more easily in among the loose cellular substance of the rectum. The operator opens the forceps, and feels in vain for the stone; he at last has an indistinct perception of the stone, closes them upon it, grasps it, and begins to pull; but the forceps slip; the bladder is betwixt the stone and the forceps. These are the true sacculated stones,\* but the sac is the bladder and the cavity is that which is made among the cellular substance of the rectum, by the turning of the forceps in search of the stone, and the opening their blades violently to grasp it. In one unfortunate case, the surgeon groping thus upon the outside of the bladder, actually grasped with the point of his forceps, and twisted away the great part of the prostate gland, which, when he had thrown it down among his feet, was picked up by a professor of anatomy who assisted at the operation, and, when the gentleman died, the parts were dissected out, and are preserved.

It is unquestionable that the gorget is often thus plunged among the viscera, and perhaps it is to be lamented that ever cutting for the stone ceased to be a distinct profession, or that the operation was brought to that kind of perfection which induced ignorant men to venture upon an operation, which, even thus simplified, requires consummate skill and knowledge. Whatever may be the apparent facility of this common operation with the gorget, that with the knife is alone secure, it is indeed

\* There are instances of stones contained in sacs: I have seen a preparation of one: the circumstance is probably rare. S.



to the last degree simple, as simple as that of cutting on the gripe; for it is cutting with the knife upon the staff, which is more easily held, fixed, and directed, than the stone. But since the operation with the gorget has been approved, and will continue to be performed, I have taught it faithfully; nothing can, in my opinion, so well prepare the young surgeons against this fatal accident, the slipping of the gorget, as knowing perfectly the causes from which it may arise. And I will now fulfil my purpose of describing the several acts and stages of the operation in that rapid succession in which they should be performed.\*

## SECTION VI.

*Of the Operation of Lithotomy.*

An operation so mechanical as this, regulated in its most critical movement by a grooved staff, should, though there must be no unbecoming haste, proceed rapidly without a pause, the several acts being connected in idea, and continuous in execution. The surgeon should never, to catch the vain applause of the ill-judging spectators, proceed in haste and trepidation; but he who can perform the operation at all, will perform it best to his feeling, and, for the safety of the patient, rapidly; for, having the purpose of the operation full in his mind, its several stages are as parts of one continued action, on which his mind is so intent, his judgment so clear and unperplexed, his hand so steady and resolved, that he moves, by a sort of instinct, without pauses, without fear. In truth, dextrous and rapid execution are synonymous words; it is not policy, but feeling and self-confidence, that carries the surgeon boldly on; this rapid energetic manner is natural and not assumed; it is even in some degree essential to the patient's safety, that the several acts should succeed each other without stop or pause,—that, the gorget should be introduced as soon as the urethra is cut,—and, the forceps instantly after the thrusting in of the gorget.

The surgeon should be prepared for this, and, in place of receiving and returning every instrument from his assistants, should draw each instrument from his girdle when he is to use

\* When this accident happens, which may be always known from not hearing the click which is produced by the slipping of the beak of the gorget from the end of the groove of the staff, and from no urine flowing upon the introduction of the gorget, if the surgeon has not withdrawn the staff, which he never should do until he is certain the gorget is in the bladder; he should withdraw the instrument and make another attempt to introduce it; but should he have withdrawn the staff the patient must be unbound, put to bed, and the wound suffered to heal before any thing further is attempted. S.



it. Every thing being prepared, he ties an apron about him, which being firmly girt, he twists a towel through the apron-string, fixes the gorget also in the string like a dagger in the girdle, and the forceps he puts in the fore-pocket of his apron. Then advancing to the patient, who is tied and placed for operation, though his posture is not yet adjusted, he dips the staff in oil and passes it gently and softly; he then dips the finger in oil, and insinuates into the rectum, to feel that all is right and fair; he then wipes the fingers that are soiled with urine or fæces, or lubricated with oil, and seats himself before his patient, on a low stool, pulling the breech towards him, till it projects fairly over the edge of the table, and pressing-in the doubling of the blanket under the breech, till he has raised it to a proper angle; he then commits the patient's feet to the lateral assistants, who are to keep the breech in this suspended posture: then reaching his right hand over the patient's breech, he takes a firm hold on the handle of the staff; presses its heel against the perinæum; feels for it immediately behind the scrotum with the fore-finger, or with the edge of the thumb; lays down the handle of the staff to the right groin, and gives it to the assistant-surgeon to keep it steady.

He now wipes the perinæum with his towel,\* lays the left hand over the hip and anus, and spreads his fingers so as to stretch the perinæum; then fixing the point of the knife just below the point where he feels the heel of the staff, (i. e. about an inch behind the scrotum) and pressing with the point of the knife to mark the beginning of the incision, he draws it with a firm and steady motion, obliquely downwards, till he passes the anus about an inch and a half, the middle and deepest part of the incision being thus opposite to the anus, but inclining somewhat towards the tuber ischii to avoid the rectum. The first stroke of the knife passes through the skin and fat; a second stroke, guided by the fore-finger, passes deep into the hollow of the pelvis, through fat tendinous fascia, and the transverse muscle, and, in short, through every obstruction, till the opening is quite free. A third dissection, in which the fore-finger is turned upwards to the pubis, while the ring and mid-fingers, a little crooked, repress the rectum, lays the staff almost bare; and then, the edge of the knife also turned upwards, as well as the finger which guides it, is struck into the groove of the staff, through the membranous part of the urethra; and the knife, being then drawn steadily forwards, slits it up from the point

\* The rectum generally protrudes in a child, from crying and ungoverned straining, and needs to be wiped and held aside by a bit of linen cloth laid up on it.

of the prostate gland nearly to the bulb of the urethra, i. e. through almost the whole length of the part that feels naked.

The edge of the thumb-nail being fixed steadily in the groove of the staff, the beak of the gorget is lodged in the groove; the surgeon, first moving the gorget backwards and forwards, reaches his left hand over to grasp the staff, takes a firm hold of it, rises from his seat, balances with the two hands for a few instants, and feeling that the instruments correspond, that the hands feel each other, and re-act mutually, and that the beak of the gorget glides smoothly and equably in the groove of the staff, he holds the staff steady, clenched in a dagger-like manner, in his left hand, and pushes the gorget steadily, strongly, but slowly, forward with his right. The moment that he feels the resistance over, and the urine flow, he begins to give that turn to the staff (viz. depressing the handle of it to the belly of the patient) by which the gorget is disengaged, and the staff withdrawn; he slips the staff into his pouch, or lays it down, seizes the handle of the gorget with the left hand, draws out his forceps with the right, lays the chops of them gently in the broad channel of the gorget, pushes them gently onwards into the bladder, and when he feels them in the open cavity, he withdraws the gorget, withdrawing it carefully in the direction in which it was pushed in, that its edge may make no second wound.

The staff is withdrawn as a part of the same motion by which the gorget is introduced; the gorget is withdrawn as a part (the concluding part) of the same motion with which the forceps are introduced; the gorget is next slipped into the pocket of the apron, and both hands applied to the forceps, one to each handle; and the operator, conscious that the forceps now look directly upwards towards the fundus of the bladder, where the stone cannot be, and that the gorget has carried them over the stone, raises the handles high, and while he opens the blades gently, points them downwards to the sac behind the prostate, and near the neck of the bladder where the stone lies; and he withdraws them at the same time a little, that they may have the stone before them: he then pushes the stone before him, and thus excites the bladder to contract, and press it close to the chops of the forceps; he closes them, and presses once or twice in directions slightly varied, according to feelings which cannot be described, before he thinks himself sure of his hold; but when he is sure, he grasps firmly, very firmly, because, if the stone be so large as to endanger its breaking, he is more willing that it should break into a hundred pieces than injure the parts by dilatation; and he now depresses the handles quite low, because the direction in which he is to extract the stone, is en-

tirely opposite to that in which he catches it. The forceps, holding the stone, now point directly upwards, as at first; he holds firm, and pulls almost directly downwards, that the pressure may be, not against the pelvis, but against the dilatable parts in the lower angle of the wound; and moving his forceps gently, slowly, steadily, from side to side, with a very wide motion, he depresses, first, the upper side of the stone, then the lower side, and so alternately, till the widest parts of the chops stretch the wound; the stone begins to appear; he holds the palm of the left hand, which had hitherto held firm the hinge of the forceps, so as to receive the stone; and with one wide motion of the forceps moving the handles largely downwards, he turns it out.

If the perinæal artery, which is unavoidably wounded, is large, and bleeds profusely, it is usually tied with the needle after the external incision, and before the urethra is cut. If the hæmorrhagy be neglected till the operation is finished, the arteries are then so bruised, and so retracted among the cellular substance, that they never bleed again; if there be any internal hæmorrhagy from arteries larger than common, coursing round the prostate gland, and cut with the gorget, it is discovered only some hours after the patient is laid in bed; it is known by the desire to pass urine, the sense of load at the lower part of the abdomen, and restlessness and pain; and it is relieved by pushing in the finger, and breaking down the coagula, which are then discharged as from the uterus in an abortion, and then, if fresh blood continues to flow, farther danger is prevented by thrusting a wide canula into the wound, surrounded with a piece of dried sponge, the canula being passed through a hole in the centre of the sponge.\*

The stone being extracted, the surgeon, having examined and assured himself that there is no second stone, lays a piece of oiled lint within the lips of the wound; unbinds the patient, and lays his thighs together, the knees being bended, and, an assistant holding his hand flat over the wound; and the patient is conveyed to bed, and laid on his right side. An opiate is given with a glass of warm wine and water; the curtains are drawn, the windows closed, and a medical attendant being left by him to watch any accession of hæmorrhagy, or abdominal pain, he is composed to rest; the urine which flows freely through the wound is received upon a thick folded cloth. The warm bath, clysters, bleeding, if he be an athletic man, and em-

\* If the internal pudic artery be divided, which it sometimes is, particularly when Mr. Cline's single-edged gorget is used, it may be restrained; for I have seen it done, by introducing, after the operation is concluded, a large doffel of lint, and pressing it firmly for some minutes against the artery. S.

brocating the lower part of the belly with spirituous applications, are the chief means for preventing abdominal inflammation.

I hope that, in preparing my reader for understanding this description, I have with proper seriousness inculcated the importance of study, and the fatal consequence of imitating, without intelligence or design, the motions of other operators; that I have not, by any presumption on my part, incited the young surgeon to any rash or unpremeditated attempt or new exploit, but have described perspicuously, simply, and with a sincere sense of duty, the most important and eventful operation in surgery.

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## DISCOURSE XIV.

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### OF OBSTRUCTION OF URINE.

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#### SECTION I.

#### *Of introducing the Catheter.*

THE operation of introducing the catheter, if it do not require intrepidity and courage, requires at least peculiar delicacy, a perfect knowledge of the parts, and, above all, a humane and steady temper; for when the surgeon is at any time conscious that he is in danger of committing violence, he must submit to the imputation of having failed, even at the risk of his reputation. The obstacles and difficulties to the introduction of the catheter are besides of so peculiar a kind, that while all our diligence to learn this art is necessary, our utmost diligence is sometimes unavailing, for the most unskillful surgeons have succeeded, by a sort of chance, even after the most dexterous have failed.

There are no circumstances in which the patient is more perfectly grateful, than for the relief which the skillful introduction



of the catheter procures; for it is a sudden and entire relief, from anguish more excruciating than any description of pain. Often the value of our assistance is enhanced by the unsuccessful attempts of others less fortunate or less skilful. To feel this uneasiness and intense desire to pass the urine, to submit to a dreaded operation, and yet to be disappointed of relief; to see the blood streaming from the penis, and still to continue in agony; to lie tossing with fever and pain, aggravated by dismal recollections of many having died of obstruction of urine; and then in the midst of these sufferings, to receive sudden relief, from the hands of a skilful man, must be accompanied with a deep sense of gratitude. Such reflections as these, my reader will not think unnatural. I would condescend to suggest even selfish motives, to the few who are born to feel no others, as inducements to study those diseases of which I am now to offer a short practical sketch; I should be inclined to blame the surgeon very much, who was not equally prepared to use the catheter as to use the lancet.

The introduction of the catheter is an operation which a good surgeon, who is able to perform with ease, would be apt to describe with little care or minuteness; and there is unfortunately in this, if any part of surgery, a kind of address which is to be attained only by practice. Yet this experience and acquired dexterity is founded on previous knowledge of the parts. I shall give, as the first and most simple lesson in this department of surgery, that of introducing the catheter, in cases where the urine is retained, not from any resistance arising from tumour or other obstruction in the urinary canal, but from paralysis or mere want of power in the bladder itself.

When, from remaining too long in ceremonious companies, in assemblies, in processions, or in courts of justice; when, from travelling in public carriages, or from any cause of delicacy or restraint, a man resists too long the calls of nature, the bladder being over-distended, loses its contractile power, and when he would pass his urine he makes vain and painful efforts to discharge it: a spasm about the neck of the bladder then arises, and resistance is added to want of contractile power; every repeated effort increases the difficulty, and pain succeeds to the simple desire of emptying the bladder. It is this pain and spasm alone that prevents the catheter passing with perfect ease, and makes all the opposition we experience in performing that operation on the living body, which is so easily performed on the dead; for, the introducing the catheter in a corpse, is not a lesson of that importance which has usually been supposed.

The catheter passes with perfect ease, when the retention of urine proceeds from a paralytic affection of the bladder, as in

fractures of the spine, in palsy or apoplexy, in confluent small-pox, in the end of low fevers. Even in cases when strangury and pain, accompanied with intense desire, have followed the simple retention of urine; in cases when the canal is generally inflamed, as in gonorrhœa, the surgeon should still be able to pass the catheter with tolerable ease. But in cases of stricture, or other disease in the urethra, the catheter is seldom useful; and where the prostate gland is diseased, it passes with the utmost difficulty, if, indeed, it can be made to pass by any means. You proceed in the following manner:

You place your patient with his back resting firmly against the wall, striding, but not very wide, his feet being projected before him a very little; and you place yourself on his left side, kneeling on your right knee; you may lay him across the bed, his feet resting on the floor, his buttocks touching the edge of the bed, and his head and shoulders supported with the pillows; or he may seat himself upon a chair, resting with his hands upon the scat, the perinæum projecting a little over the edge of the chair, and one of his friends standing behind to support him. In whatever posture you place your patient, you find the posture of kneeling on the right knee the most convenient to yourself; it gives you perfect steadiness; and, by placing yourself low with regard to the patient, you obtain a perfect command of your catheter, which, while you are introducing it, is to move in a circle.

You lift the point of the penis betwixt the fore and mid-fingers, securing the posture of the penis by pressing the glans with your thumb: then taking the catheter, which is previously warmed, and smeared with oil, white of eggs, or butter, in your right hand, you hold it firmly by the ears, betwixt the thumb and fore-finger; and while you hold by the wings with the finger and thumb, you lay the middle, ring, and little fingers, flat across the shaft, just as you would a pipe. You then apply the point of the catheter to the opening of the urethra, and glide it down steadily and rather rapidly along the urethra, drawing the penis with the left hand, pressing the catheter onwards with the right, and guiding it with a semicircular sweep round the pubis, in proportion as the catheter passes along the urethra. The two hands, thus re-acting, the catheter glides onwards without obstruction, till it has turned round the pubis, and you become sensible by the turn, by the length it has passed, and by the degree of resistance, that it has approached the neck of the bladder, and is just about to enter it.

This is the critical moment, in which may be seen whether a surgeon can or cannot pass the catheter; for if he knows how to pass it, he suddenly, but not violently, changes its direction.

He depresses the handle with a particular kind of address, and raises the point, which, as if it had suddenly surmounted some obstacle, starts into the neck of the bladder, and the urine bursts out in a jet from the mouth of the catheter.

Those who are unskilful press the tube forward, and persist, as they had begun, in drawing up the penis, pulling it out to an immoderate length, imagining, as indeed they are plainly told, that by stretching the penis, they lengthen the urethra, and make it straight, whereas, they elongate only that part of the urethra along which the catheter has already passed.

In truth the elongation of the penis does not at all affect that part of the urethra at which the catheter is interrupted, the part which lies in the perinæum, and which is fixed by various connections: a dextrous surgeon indeed generally passes the catheter with one continuous motion uninterrupted, and without letting go the penis; but when he does feel that he is obstructed he lets go the penis, as of no further assistance; he, (while his assistant holds up the scrotum,) lays two fingers along the perinæum, on each side of the urethra, and draws the fingers along the perinæum towards the scrotum, soothing the parts, and relaxing the spasm, by the pressure and motion, and acting as if the design were to work the urethra along the catheter, as he would put the bait on a hook. If this fail, he kneeling before the patient, oils the left fore-finger and passes it into the anus, the effect of which, is, I am persuaded, neither the elongation of the urethra, nor the unfolding any inequalities, of the canal, but merely lifting up the point of the catheter, by the pressure of the finger, and with a degree of force and effect which the surgeon has not the confidence to use in the proper way of bending down the handle of the staff.

From the moment in which the catheter begins to pass along the perinæum, the point should be pressed strongly against the upper side of the urethra which lies under the pubis; the catheter must be all along carried so close to the arch of the pubis, as never to lose the feeling of pressing hard against the bone, and when it approaches the neck of the bladder the point must be turned quick under the arch of the pubis, as if it were the surgeon's intention to keep it pressed close to the inner surface of the pubis. While the surgeon makes the point run thus along the bone, as if to avoid the angle at the lower part of the urethra, he must guide the catheter steadily along, holding it firm and with an action something like that of pulling, as if it were his design to hook the pubis. He must turn down the handle and raise the point of the catheter, I will not say suddenly, or strongly, but with quickness and address, as if it were his design to catch at some orifice, distinct from the canal



in which the instrument is passing, and to catch it with address and quickness, as if it were an opening which might otherwise escape.

If these manœuvres do not succeed, the surgeon changes his catheter, choosing one bigger or more slender, with a greater or lesser curve, according to what observations he may have made in his first attempt; but if the catheter has been of a good form and commodious size, yet has not passed easily, he should, instead of choosing a rigid catheter of another size or form, take one that is flexible for his second attempt. The flexible catheter is generally slender and of sufficient length, and its shape may be accommodated to all occasions, and to all forms of the urethra; for, having a stiff wire, we can give that wire (either before or after it is passed into the catheter) whatever shape we please; and, what is of still greater importance, we can introduce the instrument without or with the wire as circumstances may direct; or what I find far more advantageous, we can introduce the wire partially so as not quite to reach the point of the catheter, but within two inches or a little more of the point, by which contrivance the point, if previously warmed and wrought in the hand, has so much elasticity that it follows the precise curve of the urethra, and has yet sufficient rigidity to surmount any slight resistance. If this too fail, and especially if there be the slightest reason to suspect that the resistance is not merely spasmodic, but arises from stricture near the neck of the bladder in the young, or swelling of the prostate in the aged, we take a small bougie, turn up the extremity of it with the finger and thumb, so that the hooked point may look towards the pubis, oil it lightly and rapidly, and allowing no time for the softening of the wax, pass it into the urethra, run it down nimbly to the place of the obstruction, turn it with a vertical or twisting motion, and stick it fast in the constricted part; and having left the bougie thus fixed for ten minutes or a quarter of an hour, we usually find upon withdrawing it, (especially if, in withdrawing, we feel a pull as if it would invert the urethra,) that either the urine will begin to flow, or at least that the catheter will now pass.

But when we are unsuccessful in these operations, just as when we fail in our attempts to reduce a hernia, we resort to other means of relieving the stricture of the parts, before making a second attempt; first we bleed, bleed repeatedly, which at once prevents the most fatal of all symptoms, inflammation of the abdomen, and serves as an anodyne, and never can be superfluous where the future dangers of the case, and in some degree the present obstruction, proceed from inflammation; when we observe the condition of our patient, his flushed face,



parched tongue, and rapid pulse, we can feel no reluctance in bleeding. We immerse the patient in a warm bath, and rub the perinæum and lower part of the abdomen with stimulant embrocations, as spirituous and camphorated balsams or ointments; we lay hot and stimulant applications to the pubis, cover all the parts with a thick made poultice, impregnated with camphire or onions, and, above all, give opiate injections very strong, for we find this the most effectual means of alleviating the pain and desire, or in other words, the spasmodic action of the parts: it is spasm merely that intercepts the catheter; for were the patient dead, no such opposition would be experienced; innumerable dissections have proved that the catheter, which was not admitted in the living, passes easily into the dead body. If after a few hours of these applications, the pain is relieved, and the patient, by the force of the opium, is inclined to rest, we are then able to pass the catheter with ease; and when we have relieved such a patient, we must continue our attentions to him unremittingly; we give him prudent advice lest the same continued life of thoughtlessness and dissipation confirm the complaint; we charge ourselves with drawing off the urine thrice a day, till the parts recover their tone; and we never dismiss such a patient without acquainting him, that on the slightest excess or imprudence, he will relapse into this painful condition; for the bladder once distended is apt to be again distended, without creating any sensible effort, and, being over-distended, it loses altogether its muscular power.

The period at which a patient will recover the contractile power of his bladder must depend much on the conduct of the surgeon, who will be able to restore its tone by being careful in his attendance, and preventing the bladder being at any time filled; by directing the patient to make occasional efforts to discharge his urine, even although not incited by any desire; by applying stimulant embrocations to the pelvis; by giving stimulant and purgative injections, or, by giving, if necessary, a few drops of tincture of cantharides; and finally by applying blisters from time to time to the sacrum, which I hold to be the most powerful means of restoring the contractility of the bladder: along with these means the walking barefooted on a stone floor, or having cold water dashed or sprinkled about the pelvis, is very effectual in seconding the efforts of the patient.

If in introducing the catheter, you find your instrument stop early in a lower part of the urethra, and have reason, from the history of the case, to believe that the obstruction arises from stricture, you must not persist in pressing on your instru-

ment, but withdraw it, and pass a small bougie, or use a caustic.\*

If, in passing the catheter, you encounter a stone, which you know by the catheter grating against it, be not rash to drive it back into the bladder, but press your finger upon the perinæum behind the stone, lest it should be driven back,—withdraw your catheter, and stop to consider of the case, and the means of giving safe and permanent relief.

But if from the age of your patient and the history of his complaint, you suspect the prostate gland to be diseased, and especially if, from introducing your finger into the anus, you are assured that the complaint is of that dismal nature, you may, after having failed in the common way, turn the concavity of your catheter towards the perinæum, and turn it at that point of your progress in which you are sensible of the opposition from the diseased gland and would pass your instrument through it. I have sometimes imagined that this method of operating contributed to open the cleft or valve-like mouth of the tumid prostate.

I am next, I confess, anxious to make the due impression on my reader's mind, when I come to explain a prejudice which has indeed almost ceased to appear in this odious light, from being avowed by men of high reputation and supported by facts. It has been asserted, that, though upon introducing the catheter, blood flows from the urethra in a full stream, "No harm is done; such hæmorrhage is rather useful, and facilitates every future attempt to pass the instrument." I will freely acknowledge that often, from a slight injury a great profusion of blood will flow; this is an inevitable consequence of the peculiar structure of the parts, and no great harm ensues; but that such a discharge of blood is entirely harmless, is a sign of dexterity, or of any thing but awkwardness, violence, and a breach of the cellular substance, I cannot allow.

\* In this case, as well as the foregoing, the patient will be in general relieved by bleeding, anodyne injections, &c. For even where strictures exist, spasm is frequently the immediate cause of the retention of urine. S.

## DISCOURSE XV.

OF THE VARIOUS CAUSES OF OBSTRUCTION  
OF URINE; STRICTURE, STONE, INJURY OF  
THE PARTS FROM BLOWS, &c.

## SECTION I.

*Of Stricture.*

THE stream of urine small and tortuous, even in the sound state of the parts, impresses us naturally with an erroneous conception of the size of the urinary canal. Mr. Home, having injected it with wax, was surprised to find the roll which represented the urethra so large; and I myself, when I made a drawing of the urethra, could hardly believe my drawing at all correct or faithful; for the urethra though corrugated in the living, is, when expanded in the dead and dissected parts, full half an inch broad. This canal, made for dilatation, is full of rugæ; and the bigness of the stones which pass along the canal, and the size of the catheter which it receives with ease, intimate to us its natural dimensions and peculiar conformation, which is such as to enable it to dilate into a large sac, wherever the passage is obstructed by a stone or stricture, and the urethra is forced by the propulsive power of the bladder.

It is to no peculiarity of organization, that I would ascribe the disease we call a stricture of the urethra: I ascribe it neither to the rugous form of the internal membrane, nor to the muscular and contractile power with which the whole canal is supposed to be endowed; though the fact of an occasional or spasmodic stricture, ending in permanent disease, seems to argue this very strongly. As the tumour, which is a wart on the skin, is a pile when growing near the anus, or a polypus when in the passages of the nose or throat; so that vascular action and thickening of parts, which externally would form a tumour,

forms a stricture in any hollow tube; and the stricture is still the same, whether it form in the throat, rectum, urethra, or prepuce. Stricture is tumour, and, as a tumour must perpetually increase while the circulation survives in the part, unless a total adhesion of the canal, by obliterating the cavity, put an end to the action. "When in a small degree, (says Mr. Home) this contraction appears, upon examination after death, to be simply a narrowing of the canal at that part; but, when the contraction is increased, it *becomes a ridge, projecting into the canal.*" Page 21.

Those who have been troubled with an occasional or spasmodic stricture of the urethra, have every reason to fear that it will become permanent: yet I have often observed stricture to be merely spasmodic, and I think I have found it often a sort of febrile disease. The stricture I speak of is more frequent in winter, arises from cold, is attended with fever, and is more easily cured by any thing than the bougie, which but aggravates the complaint. This febrile stricture I have frequently cured in men of the most chaste and exemplary lives, free from the slightest pollution, married, and of intelligence much above any kind of secrecy, where they were once pleased to give their confidence, men who never were diseased. The fit of obstruction is preceded by head-ach, languor, and listlessness, while the obstruction continues; and the accession of the hot stage, which comes on in the evening, and especially the paroxysm of perspiration, which comes on during the night, is generally a forerunner of relief. I have seen the obstruction so complete that not one drop of urine has passed, though accompanied with a degree of desire which urged the patient to place himself in the posture every quarter of an hour, and with such violent straining as produced a partial erection of the penis, whence always the obstruction became complete, though not so before; the bougie being at the same time resisted at a single point as fairly as if the stricture were permanent and organic. I have gone to such a patient at midnight, with catheters and bougies, resolving to relieve him from the distension of the bladder: yet feeling a degree of reluctance at using harsher means, I have, by ordering a sharp emetic, followed up by a strong dose of laudanum with hot wine and water; by rubbing the perinæum very hard at the same time with camphorated mercurial ointment; and by fomenting the lower part of the belly, if necessary, with a hot stimulant fomentation, or wrapping the parts in a large poultice, been saved from doing any thing painful, and have been rewarded for my patience and prudence, by seeing the urine discharged freely next day, and continue to flow in a full and easy stream.



I have, after a scene of this nature was over, found the bougie pass with perfect ease into the bladder, and have the pleasure of knowing that many who have been alarmed with these symptoms have continued for years free from organic disease, though thus affected from spasm.

The sudden and total obstruction, which I have just described, is often seen in the conclusion, but rarely in the commencement, of proper stricture, which usually betrays itself by little accidents, and symptoms not at all distressing. The patient, who has a real stricture, whether from venereal complaints, from excess committed in warm climates, or from any accidental cause, is far gone in this malady before he is conscious of it. He is first thoroughly alarmed by a sudden interruption of his urine, when, having sat at table with his friends, he has allowed the bladder to fill beyond its natural and easy condition; for that straining which accompanies over-fullness of the bladder, causes a state of half erection of the penis, the cellular substance thus filled with blood, compresses the canal of the urethra, and aggravates any latent stricture, till the urine is actually interrupted. The patient, the more he strains, feels the difficulty the more; he but increases it by straining, and now observes, in a particular manner, the smallness and the spiral form of the stream of urine: from this unfortunate hour his situation attracts his attention, and his disease increases; he recollects that at times, especially after coition, he has had such a degree of running for three or four days as has inclined him to believe himself infected with gonorrhœa; he has felt occasionally slight pain in the urethra, accompanied with very frequent desire to pass urine, which he is in the custom of discharging every three or four hours. He now remembers that for some time he has been forced to rise, according to the quantity he drinks at supper, three or four times during the night; and all this he would willingly ascribe to spasm, because organic stricture is indeed always accompanied with spasm; the difficulty of making urine, far from being permanent, returns in paroxysms, is aggravated by cold, increases in winter, and in summer almost disappears, is easy while the patient is in a warm chamber, is absent almost entirely when he perspires, returns upon exposing himself to the air, and those paroxysms, which last three or four days, proceed usually from changes of habit, so slight, that he can hardly mark the cause. But this running like a gleet, returning, upon using venery, accompanied with irritation, but never arriving at the virulence of a clap; this occasional difficulty of passing urine, and the frequency of the desire to pass it, are among the most certain signs of incipient stricture, which ends at last, sometimes in the course of a few

months, (though often it is delayed for years) in unequivocal disease.

This scene of suffering once begun, is renewed from time to time. The running, and the desire to pass his water, increase every time he attempts coition, and he is threatened with absolute and total obstruction every time he drinks hard, or rides a hunting, or travels post, exposes himself to cold, is seduced into debaucheries, or any way interrupts the quiet tenor of his life; and when stricture is thus confirmed, it is accompanied with new and unequivocal sensations, for along with urine the semen is obstruction, coition is attended, in the moment of ejaculation, with a spasmodic action of the accelerator muscle, creating a sharp and thrilling pain; though the sense of emission is complete, the point of the penis continues dry; the semen recedes into the bladder, and sometimes is observed to flow along with the urine: in this state of things barrenness is one consequence of the obstruction, though it be in such a degree only as retards, without entirely preventing, the rapid ejection of the semen.

Betwixt that obstruction in which the urine is forced off drop by drop, with violent straining, and that in which the bladder is entirely obstructed, the limits are extremely narrow, the slightest imprudence, the being unavoidably exposed to cold and moisture, will suddenly bring such a patient (like one labouring under hernia) into extreme peril; for after the obstruction has passed a certain point, no straining will force off one drop of urine; nothing but the introduction of the catheter can give relief, and it is not in every village that assistance can be procured. If the surgeon arrives but a little too late, the bladder is distended to its utmost pitch, and far beyond its natural size, the tossing and uneasiness are very great, the abdomen begins to be inflamed, the pulse is quick, the tongue parched, the lips black, the eyes inflamed, the visage pale and ghastly; and the patient, after twenty-four hours of insensibility, or of low and muttering delirium, expires. Thus, in villages and parts remote from help, many valuable lives have been lost; and when in this doubtful state, not apparently ill, yet bordering on the greatest dangers, no officer can go to sea, no soldier can go into service, no country gentleman can retire to his estate, without extreme hazard.

Without most culpable imprudence the disease is rarely fatal, but the patient, by the natural course of things, falls, if neglected, into a most miserable and loathsome condition; for, from the moment that the obstruction is nearly complete, the portion of the urethra, which lies behind the stricture, is exposed to the whole force of the bladder and abdominal muscles, it is soon

affected, as an artery is in natural aneurism, (i. e.) it is first dilated, then inflames, then bursts, then the urine spreading (as yet not widely) among the cellular substance, causes indurations of a singular hardness, as if they were rather knots of callus, gathering round a fractured bone, than inflamed cellular substance surrounding a breach in this thin and delicate tube. Such thickening, excited by the urine, forms but a slight and temporary barrier to the ruptured part of the urethra; the knot extends and grows, it becomes red on the surface and softens, it suppurates with little pain, and bursts slowly; but when it bursts, the urine issues through the opening, the abscess spreads in various directions; the surrounding parts are all affected; the patient often loses, from mere irritation, the power of retaining his urine, the ulcers and fistulas become foul and sloughy, the linens and the bed are incessantly moistened with urine. The patient is exhausted with fits of incessant vomiting, and is shaken by paroxysms of fever, apparently peculiar to this disease, such as make his teeth chatter and the bed shake under him during the cold stage, and when the sweating comes on, the sheets and bed-cloaths, the bed, and even the mattress, are soaked with perspirations, and the smell of his room resembles that of a Russian bath. If in this condition he be neglected but a few weeks, or unskilfully treated, if that fever is combated with bark and emetics, which ceases only when proper surgical incisions are performed, if the obstruction is left untouched, and the sinuses unopened, and the matter permitted to work its way deeper among the cellular substance of the pelvis, the patient sinks gradually lower and lower, loses all desire for food, has a cadaverous and jaundiced aspect, faints when raised in bed, and at last dies.

Stricture is a tumour or growth, and the striking a firm bougie into the ring, and wedging it there, can do nothing but excite the action, by which the stricture is produced. I have seen the patient under the old regimen, endure much torture, and with wonderful fortitude. The wedging the bougie into a stricture, recalls all the feeling to that part, and excites an inexpressible desire to pass the water, to retain the bougie half an hour at first using it, is impossible; the irritation does not cease when the bougie is withdrawn; after the passages are inflamed the mucous flux is increased, the desire to pass urine becomes extremely urgent, if the urine passes more easily at first, the relief is but momentary; never can the patient feel relief till after he has learnt to endure the bougie for hours, and continued to wear it for months. To live thus for months or years, is but protracted misery; and to see the stream of urine gradually lessen at every intermission of torture, and to be sen-



sible that the disease, never cured, tends incessantly to return, make the patient desperate, and he feels that life is not worth holding on such terms. It is this state of protracted torture and disappointment that affects so visibly, the physiognomy, temper, and general health of a patient who has stricture; it is this that produces the chagrined countenance, sallow complexion, and wasted habit; and often it happened, while bougies were used, that false routes were produced by the irregular pressure of the point of the bougie, cavities were formed by the sides of the canal, and the canal itself well-nigh obliterated by this new cause of compression; the bougie passing thus into the cellular substance by the side of the stricture, the urethra behind the stricture, dilated under the force of the bladder, and the parts fell into a complicated state of disease.

With this long suffering and ill success, let us contrast the effects both immediate and ultimate of the caustic bougie. When the caustic is pressed against the ring of a stricture, none of those ill consequences predicted by theorists, ever are produced; there comes over the patient a confusion and a sort of alarm arising from the novelty of the sensation, which makes the most vigorous and hardy man tremble like an hysterical girl, and shiver for ten minutes with the pale and contracted visage of one in terror. Yet the patient is not in a state of suffering; he talks all the while freely, and feels neither any deep sense of burning, or any other description of pain.\* Nor is there any thing of that immediate inflammation and swelling which it was so natural for the theorist to predict, which it was supposed would infallibly close the canal, and entirely suppress the flow of urine, at least for a time. There is indeed very often, a hæmorrhagy, but it is of that kind which has been thought so slightly of, when it flows from introducing the catheter; and in the present case alone is such hæmorrhagy desirable; for, as it is a sign of the caustic having penetrated to the cavernous body of the urethra, it is a sign of success. Neither does the effect of the caustic extend along the canal, nor operate, except on that point against which it is pressed; the swelling even of the burnt part is not perceptible; the mere act of touching the stricture with the caustic, instantly gives a degree of relief; for the caustic KILLS what it touches; there is no intermediate state of inflammation; the part shrinks, and the opening, though

\* Notwithstanding what Mr. Bell here says, patients sometimes evince by their actions that they suffer the most excruciating agony upon the introduction of the caustic, as I have often seen; and wherever the common bougie would answer, (and that it frequently will, I can aver) I should prefer it. S.



affected but in a trivial degree, is actually and instantly enlarged; in short, THE NAME ONLY OF CAUSTIC IS ALARMING.\*

The bulb of the urethra is a natural dilatation of the canal, fit for receiving the semen, which is poured into it during coition, and ejected from it by the smart action of the accelerator muscle, in the moment of emission. Immediately behind this dilatation or sac of the bulb, the urethra, where it enters the bulb is naturally narrow, and joins the bulb with something like a ring, or natural stricture; and it is here, at this point naturally strait, that the stricture is formed; a second stricture is often found a little beyond this point, about half an inch nearer the neck of the bladder: and whether there be one or more strictures, they lie so far down in the urethra, that one, unaccustomed to introduce the bougie, would believe that he had passed it along the whole canal, and that it had entered the bladder; and when he feels resistance, he would suppose it to arise from the natural straitness of the prostate gland: if there be other strictures than those near the neck of the bladder, they are usually in the penis, often about the middle, very commonly in that part of it from which the scrotum hangs.†

It is the number of successive strictures that makes the most formidable resistance to the passage of the urine, and a person unacquainted with this department of practice, having applied his caustic, and at last plumped his bougie unpremeditatedly and suddenly through a complete stricture, would be apt to triumph, but the urine flows not a whit the more easily; and upon introducing a bougie as a probe, the second stricture is distinctly felt.

There is no other evidence of the existence of permanent stricture but the bougie, nor is it even a very absolute test: I have found the bougie stick firm, as if engaged in a stricture, which, after the spasm which stopped it had subsided, has passed with perfect ease. I have often seen the bougie introduced by the patient, and so fixed, either by its point hitching within one of the lacunæ, or by some other accident, that no degree of force could have driven it onwards, whereas, upon withdrawing it a little, and passing it on in a true direction, or

\* For a very ludicrous denunciation of dangers to be apprehended from caustic, by half a dozen of grave and learned Doctors and Professors, see in Mr. Home's book on Strictures, page 5.

† "Strictures occur most commonly," says Mr. Home, "just behind the bulb of the urethra, the distance from the external orifice being six and a half or seven inches; the situation next in order of frequency, is about four and a half inches from the orifice of the glans; they do occur at three and a half inches, and sometimes almost close to the external orifice." Home on Strictures, 2d Edit. pp. 27, 28. S.

withdrawing it altogether out, and using a fresh and firm one a little larger, it has gone on easily to the bladder.

When your own or your patient's suspicions of stricture have gone so far that you meet with him to decide the question, you first make him pass his water before you, that you may remark the size and form of the stream: you next take a bougie of a respectable size, by no means a small one; and, having oiled and bended it somewhat in the form of a catheter, you introduce it before it softens; and always, in passing the bougie, whether simple or caustic, you are quick and dexterous in running it up to the constricted part, before it begins to soften, which it does very suddenly, when affected by the heat of the urethra. You proceed thus: you raise the point of the penis with the left hand, you then introduce the bougie with the right, and run it on suddenly, till having passed the scrotum and reached the perinæum, you change your left hand from the penis to the perinæum, you press in the points of the fingers of your left hand behind the scrotum, and run them back along the perinæum, accompanying, as it were, the progress of the bougie; and while you push the bougie smartly on with the right hand, you press in the perinæum with the fingers of your left hand, directing the points of your fingers so as to turn the point of the bougie directly upwards, before the anus, at the place where you expect to feel the stricture. You feel the resistance and assure yourself of the stricture. You satisfy yourself that the bougie, in place of going onwards, is curling up under the force of the pressure, you then withdraw the bougie and find it curled like a pig's tail, but with a point not at all ruffled, because it was never admitted within the ring of the stricture, so as to receive any impression from it. Either now or at some future occasion, you measure the stricture, by using a bougie small enough to enter into it; you take a small pointed and stiff bougie, give it the bend, introduce it after the same manner, but instead of stopping, for fear of giving pain, you press it on and wedge it firmly into the stricture, where, if it be pressed but a very little, it takes a hold and is withdrawn again with difficulty, and with a sort of feeling as if the urethra were inverted by it. Upon being altogether withdrawn, the wax is found ruffled on the point of the bougie, a sort of ring marks the part embraced by the stricture, and the progress which the conical point of the bougie had made in the stricture, denotes the size of the ring.

The application of the caustic really and effectually to the stricture thus discovered, is no easy matter. The most dexterous apply it sometimes twenty or thirty times without success, while it happens not unfrequently, that the armed bougie plumps

through the stricture at the third or fourth experiment. Those bougies which are made in London, are certainly the best, for they have a long caustic securely lodged, and sufficiently exposed; yet I make armed bougies perfectly satisfactory to myself, by cutting the pencils of caustic nicely, introducing the point of a sharp pen-knife into the point of the bougie, and turning it vertically, till the centre rolls of cloth, of which the bougie is composed, are scooped out and the outer circle only left; then the caustic being lodged in the hollow and the edges of the cloth, of which the bougie is composed, folded over it, a small round knob of the caustic is left exposed, and the bougie which had softened under the modelling of the fingers, is laid by to harden; the edges of the plaster having then taken a firm hold upon the caustic.

When the caustic bougie is to be introduced, I like to pass a common bougie before it, liberally besmeared with oil, not to ascertain the place of the contraction so much, as to lubricate the passage, and make the caustic glide quickly to the destined point. Then placing the patient, and bending the bougie as just directed, you (having oiled the point of the urethra, and spread its lips, that the caustic may not, as often happens, touch the point) glide the bougie down nimbly and quickly down the urethra till it is resisted by the stricture; you then change the fingers of your left hand quickly from the penis to the perinæum, and there, by pressing them in succession, you direct and work on the bougie with the left hand, and prevent it bending, while you force it into the stricture with the right; and all this must be smartly, nimbly, and dexterously done, for the bougie soon softens and bends, and you have no longer any power over it: having struck the bougie firm into the stricture, you keep it pressed home against it for a few minutes; the patient at first feels very little indeed, only the slight pain of pressure, which, however together with the novelty of the sensation and the alarm, makes him blanch and almost faint, or at least be seized with a cold and trembling fit, shaking as if in an ague. The pain is nothing compared with the patient's imaginings; though the name of the caustic sounds alarming, the sense of burning which it occasions is very slight, the bougie, after a few minutes, is withdrawn, and the slight irritation occasioned by it subsides.

There sometimes accompanies the application of the caustic, a slight tinge of blood, a degree of ardor urine, an increased desire to pass the urine, but indeed the pain and irritation are so slight, that the patient is contented and easy in his mind, and his urine flows more freely than before; he is at all events freed from that apprehension which he could not but feel when



he thought of having a caustic bougie passed into the yard. But the stream of urine which was a little enlarged by the first application, becomes smaller again, the caustic is again applied, and on the fourth or fifth, or perhaps the eighteenth or twentieth application, sooner or later, it passes through the stricture, and the urine, if there be no second stricture, flows with perfect ease.

The young surgeon, in the course of his practice, will observe and be perhaps alarmed with several unexpected circumstances. First, he will sometimes be alarmed with the apprehension of the caustic having dropped from the end of the bougie, and it often does actually excoriate a great length of the canal, but the worst consequences produced even by this accident, are an unusual degree of irritation in the course of the canal, running as in a smart gonorrhœa of thin and bloody serum, a heat of urine, slight pain in the perinæum, and sometimes slight pain in the testicle. I have seen large flakes of the lining membrane of the urethra discharged along with the bloody serum; but the worst of these symptoms subside, and in a few days the caustic can be applied again. Secondly, he will be surprised to find, when he chooses the largest caustic bougie in order to make sure of the effects of his caustic, that it has actually no effect, for though a large bougie exposes a greater surface of the caustic, that surface does not come in contact with the stricture; a smaller bougie is more fairly admitted into the ring of the stricture, and has, according to my observation, a much happier effect. Thirdly, he will be surprised with the rude and unusual sensation the bougie conveys to his finger when passing through the stricture; for at that particular application in which it passes through, there is no determined interruption! but in the moment when the bougie approaches the neck of the bladder and is passing through the cauterized ring, it is felt to grate along as if it were passing through a shot hole in a rough deal board. Fourthly, he will sometimes be alarmed even by the happiest presages; for often there comes on so profuse a hæmorrhagy, that, instead of urine, nothing but blood seems to run from the urethra, in a full stream, as freely as from a vein in the arm, hanging in coagula from the point of the yard. Yet such hæmorrhagies imply nothing but success, for they arise from the sloughs having destroyed the stricture, and penetrated into the cavernous body of the urethra: a profuse hæmorrhagy, while it is actually harmless, is a prognostic of a speedy cure.

The horror and shivering which the patient, though suffering neither fear nor pain, cannot suppress; a shivering so violent as to make the teeth chatter audibly, is no sign, as far as I can distinguish, either of safety or danger, of success or failure; but,



if any thing, it intimates the successful application and action of the caustic, for in the same patient I do not find the same paleness or trembling upon introducing the common bougie. I have sometimes on the evening after applying the caustic, found my patient vomiting from the nervous affection, and sometimes I have seen him, after a long fit of shivering, slightly delirious, without any perceptible fever. The sickness and delirium, resemble those from intoxication. The sickness is of so unusual a kind, that the patient has not time to stretch out his hand for the basin, and the delirium or confusion of the head, accompanied like that of drunkenness, with particular stupor. Fifthly, the young surgeon will be often surprised to find, while he is despairing of success, that his patient informs him of his cure, of having passed his urine freely and in copious streams, and especially he will be surprised when informed, that the flood of urine has pushed on before it a stone of considerable size. But, in truth, stones are often formed behind a stricture, from small particles of gravel sticking there and accumulating; and when the stricture is destroyed, the stone passes and drops into the water-pot the first time the urine is freely discharged. The surgeon and patient are alarmed at the first, by every unusual symptom, are soon reconciled to the use of the caustic, then become familiar, and are at last doubtful of any effects, bad or good, from this application; but a surgeon experienced in the use of it is not dismayed, although he perceive no effect after many applications. The bougie often starts unexpectedly through the stricture, the fifteenth or twentieth time it is applied; it has been applied forty times, by the most skilful, without effect, and has at last succeeded. To mention thus the occasional circumstances which accompany the cure, is perhaps the surest way of preventing alarm, and ensuring success.

## SECTION II.

### *Of Fistula in the Perinæum and Urethra.*

From these simple obstructions I proceed to describe more complicated scenes of distress, arising not solely from stricture, but from any cause obstructing the urinary canal: for whether a stone sticks in the urethra, or by a blow on the perinæum swelling and inflammation are produced, whatever cause prevents the urine from passing freely exposes the urethra behind the obstruction, to be dilated, inflamed, ulcerated, or even burst by the force of the bladder.

It is not to be told what difficult and perplexing forms this

complaint assumes, how anxious, careful and curious, the surgeon's inquiries must be before he can understand the extent, form, and other circumstances of any particular fistula; I shall therefore be at pains, both by my arrangements and descriptions, to give the young surgeon clear conceptions of this disease.

There are three general cases which demand especial attention:

First, The obstruction of urine proceeding from some violence to the perinæum, from a blow, a fall, or other accident by which, though the skin remains entire, the urethra itself is lacerated, and the urine, obstructed in its natural passage, bursts, along with the extravasated blood, into the cellular substance of the scrotum and perinæum, and makes external openings by causing a gangrene of the parts.

Secondly, The canal obstructed by the sudden impaction of a stone in it. The case ill understood, and the urethra exposed to the force of the bladder, by which it is dilated into a sac, in which the original stone is gradually augmented in size, while other stones are often generated.

Thirdly, The fistula arising sometimes from stricture; sometimes from venereal or scrophulous ulceration, which, in its progress, is accompanied with a succession of abscesses, various openings through which the urine is discharged, and extensive indurations of the surrounding cellular substance; till at last, the perinæum and scrotum, perforated at various points, and discharging urine, pus, and flatus from the putrid cellular substance, resemble in lividness and hardness the integuments covering a diseased bone, while the patient is wasted with successive paroxysms of fever and pain; by want of rest, and by the uncleanness and offensive smell. Let these slight definitions serve to indicate the chief subjects of the following discourse.

The membrane of the urethra is delicate and easily ruptured, and the cellular substance surrounding it is like a vein full of blood continually circulating in it. The urethra itself, or the cellular substance of the urethra, is often burst by a blow or fall upon the perinæum, as in trying to leap across forms or chairs, or slipping a foot in crossing a stile; or by masons, miners, or sailors, falling from a height and alighting among loose stones, or upon projecting beams, or upon the breech of a gun, or the fluke of an anchor. The urethra, or cellular substance of the urethra, being burst by a blow, the blood either flows from the penis, or is extravasated in the perinæum according to the degree of injury.

When the lining membrane of the urethra alone is burst by

the fall, the blood runs from the penis in a full stream to the great terror of the patient, who apprehends the most horrible consequences; but it is like that hæmorrhagy which follows the rude introduction of the catheter, harmless: the blood flows indeed as freely as from a vein, but it coagulates, and the hæmorrhagy stops of its own accord: it is indeed renewed by the passing of the urine, the clots which are in the urethra being forced off in long strings, or bolted out in small knotty coagula; but it stops again: and though I have often seen such hæmorrhagy proceeding from a venereal ulcer in the urethra bleed thus for three days, and though I have at last been obliged to lay a compress upon the penis, and lay it down upon the belly with a bandage to stop the hæmorrhagy, I never yet saw the patient injured by the loss of blood.

I have had patients run into my room with their pantaloons filled with blood, but I have seldom been obliged to use pressure, to which the whole canal of the urethra, and especially the bulb, is so fairly exposed, that no harm can ever happen. When blood flowing along with the urine comes thus from the cells of the urethra it flows in a stream; and when coagula are formed they are long, slender, and stringy; but when the blood flows, as I have seen it, from the kidney into the bladder, or from the ulcerated surface of the prostate (a part which is surrounded with a plexus of veins) the clots are very condensed, round, and firm; they obstruct the urethra and neck of the bladder so that the force required for their expulsion is very great; the patient, every time he passes his urine, stalks about his room in all the agonies that those feel who have actually the stone; and when, after many efforts, the clots are propelled through the urethra, they bolt out to a great distance.

When the blow is very violent, the bulb of the urethra is completely burst, blood flows from the penis in great profusion, and a tumour is observed in the perinæum arising from the same extravasation of blood. The extravasated blood, like that of an aneurism, makes a rapid progress among the loose cellular substance of the scrotum, which swells sometimes to the size of a child's head. The blood is pushed forward also under the skin of the penis, till the swelling of the prepuce entirely hides the glands; and the blackness extends upwards over the belly and down the thighs. A surgeon well acquainted with the structure of the parts, even though not skilled in this department of practice, will easily perceive that the urethra is burst, and will no sooner see blood effused and an extending ecchymosis, which is comparatively harmless, than he will apprehend, next an effusion of urine into the cellular substance, which is full of danger; and, the moment he sees an effusion



of urine, he will make no delay, but perform those incisions which are necessary to save the parts, especially the skin of the perinæum and scrotum from destruction. When the patient feels the sense of passing urine so distinctly that he cannot be persuaded that it is not passing, but by seeing the point of the penis dry; when the scrotum and perinæum, which were at first swelled and livid, become puffed up suddenly; when the swelling, which was at first firm and resisting, becomes soft, and gives a crepitating feeling, and especially when no urine passes, and yet the patient feels the usual relief, the surgeon may be assured that the urine is passing into the cellular substance; that the parts will soon fall into gangrene; that the testicles, and perhaps the penis, will, by the sloughing of the skin, be left naked and exposed, and the skin of the perinæum partly or entirely destroyed. These are most dangerous circumstances, and the fate of the patient depends directly and plainly on the talents and discernment of his surgeon: and there are two modes of proceeding, one of which leads to safety, and converts a dangerous accident into a very simple case in surgery; the other, of which there are unhappily too many precedents, leads to destruction.

If, when the surgeon arrives, he is not aware of all the consequences of the accident; if he do not reflect more upon the effusion of urine soon to take place, than upon the present difficulty of introducing the catheter; if he calls a consultation of surgeons chiefly to assist him in the introducing of the catheter, or in consulting about tapping the bladder: if one or two days are lost in vain attempts to introduce the catheter, and in the unmeaning and trivial occupation of applying fomentations, embrocations, and poultices to the parts; the parts fall inevitably into gangrene; and it has actually happened that, while a grave consultation has been deliberating on the means of drawing off the urine, it has been escaping into the cellular substance and causing gangrene; and after gangrene has actually taken place, they have, in a fit of despair, and to accomplish they knew not what, tapped the bladder from the rectum; and yet, after all this destruction of surgery and disease has been consummated, the parts have healed in so kindly a manner as to prove that nothing was required but a few superficial incisions to keep the patient in safety.

The stricture of the parts and usual consequences then of this accident being considered, the surgeon cannot easily mistake what is to be done.

First, no doubt he is to introduce the catheter; it is the most obvious and easy means of preventing effusion of urine, and restraining the extravasation of blood: and, if the flexible ca-



theter can be introduced and left in the bladder, it will ensure an easy cure. But generally the surgeon will find a degree of obstruction at the ruptured part, which he dares not overcome, and be sensible of the point of his catheter lodging in a sort of sac. When he is conscious that he cannot pass the catheter, he will not think of perforating the bladder; if he is to perforate at all, he will perforate the perinæum, where already the urine begins to be effused, and where his knife will uncover, and his medicines reach, the ruptured part of the canal. He will treat this case of effusion of urine into the scrotum and perinæum according to the analogy of air effused from the lungs or trachea; i. e. he will take care to provide an exit for the urine which is already effused; and he will be careful to support a free outlet for that which may continue to be discharged till the natural passage for the urine be restored by nature or art. With these views he will make small incisions proportioned to the bulk of the tumour; he will place one incision in particular so over the ruptured part of the urethra (which he can mark by the stopping of the catheter there) as to provide in future free egress for the urine. Having relieved the parts thus, he will expect the swelling to subside so far as to allow him soon to pass the flexible catheter along the canal of the urethra. In the meanwhile all is safe, and, when he is able to introduce the flexible catheter into the bladder and leave it there, the breach of the urethra heals over it, or will indeed heal without the catheter, if the external wound be not tortuous, nor fistulous, but free and open. No poultice nor fomentation should be applied to parts in this condition: they must be moistened from time to time with vinegar and spirits: they must be kept dry and clean, and wiped at every time they are soiled with urine: the compresses dipt in spirits should be supported with gentle pressure: the wounds, especially that which is opposite to the urethra, should not be crammed with lint or other dressings, but dressed lightly with gentle escharotics, as red precipitate mixed in a small proportion with any ointment. The sloughing parts (if there has been a great destruction of parts) must be touched lightly with turpentine, not burnt up by a perpetual application of it; and any edges that become particularly callous, may be touched with lunar caustic. It is so essential to prevent ill consequences, that the parts endangered by the effusion of urine be freely exposed, that I am earnest in recommending the practice to my reader on all occasions of this kind.

Yet these are not cases of fistula: there is no long continued disease, no collosity, no irregular passages through which the urine flows with difficulty; but direct and clean incisions, which should easily heal: nor do I account those sores to be properly

fistulous which proceed from stones arrested in their passage along the urethra: yet, when a stone stops in the urethra, and the urethra is dilated behind it in form of a sac, it is a mere dilatation of the lubricated canal, and the surface of the sac, when at last it does burst or is opened, is very little disposed to granulate or heal. The surgeon, who is thoroughly acquainted with the structure of the parts, has this unquestionable advantage, that, in any given accident, in any complicated case, when some particular cause is producing disorder and exciting disease, he reasons correctly on its consequences, foresees all that may happen, and anticipates whatever symptoms it is possible to prevent: in the case, for example, of stone either dropping down from the kidney, or formed in the bladder, and driven on by the stream of urine along the urethra, he will easily anticipate the consequences, or at least understand them when they do present.

A stone, while within the urethra, is pushed on by the stream of urine, but the moment it is delivered from the urethra, and lodges in the prepuce, the urine no longer urges it forwards; and if the prepuce be narrow, the stone remains there, and especially in boys, who are unconscious of the cause of their pain, and do not seek relief, it remains till it acquires an extraordinary size. When a small stone is thus lodged under a narrow prepuce, the stream of urine being from time to time particularly strong, the stone presents itself at the narrow opening of the prepuce, the prepuce then sustains the whole force of the bladder, and is dilated, and, by successive dilatations and fits of inflammation, it is made to thicken, and grow into a sac of considerable size. In a little boy the prepuce has been thus enlarged to the size of a French apple, the size of the bag, and the narrowness or stricture of its point, increasing in equal proportion, and the stone moving within the sac, like the pea in a cat-call, often presenting so as to obstruct the urine, and pushed back by the mother with a pin or bodkin, so as to give the boy relief by emptying the prepuce. The stone has been allowed, from the timidity of parents, to remain for years till it has increased from the size of a pea to that of a nut, and in men grown in years a succession of such stones have been formed under the prepuce, one being generated as another was discharged. The inconvenience of pushing such a stone back to make way for the urine, has been endured for years rather than endure the simple operation for the phimosis, viz. cutting up the foreskin.

Stones passing along the urethra are often interrupted by that narrowness of the canal, which is observable immediately before the bulb whence they are fixed in the perinæum: often again they are interrupted at the very point of the glans, the orifice being encircled by a sort of membranous ring, which

girds it and makes it narrower than any lower part of the canal. The canal is, in all its length betwixt those two points, so equal in its diameter, so lubricated, and so dilatable, and the bladder is so powerful in its contraction, that the stone seldom stops at any intermediate point, or never longer than a day; during which time the urine passes in such quantities by the side of the stone as to relieve the bladder, while the bladder dilates the urethra, so that the stone makes its progress slowly, insensibly, in respect of its descent, but with great pain. I never knew a stone stop at any other point than either the perinæum, or the very opening of the glands. I never have found it necessary to cut the urethra, nor even to use those means, as blowing into the urethra, or dilating it in any other way, which have been spoken of ever since the days of Prosper Alpinus: in ninety-nine of a hundred cases, stones once engaged in the urethra, pass along without the help of art; but if they are delayed it is in the perinæum, and it is necessary here to tell the consequences.

When a stone actually stops in the urethra, it is usually at the turning of the urethra, under the pubis, at that narrower part where stricture usually occurs. On the first day there is a total obstruction, with intolerable pain, from which the patient has no relief; on the second day, the force of the bladder overcomes, in some degree, the resistance of the urethra, and urine begins to pass by the sides of the stone. But while the urethra is suffering this pressure, it is in some degree dilated; and if the stone be immovably fixed in the urethra, the dilatation increases till such a sac is formed as is capable of receiving the stone. Then it rolls back into the sac and lies there, out of the course of the urine, which passes at times freely, but at times is interrupted, the stone being, by the contraction of the parts, placed opposite to the urethra: and thus it happens that the urethra is exposed, from time to time, to the force of the bladder, the preternatural sac is dilated more and more, and being enlarged much beyond the size of the original stone, is capable of containing a small quantity of urine. This lateral sac of the urethra resembles a second bladder, and other stones are formed in it: now the parts are thickened, the bulk is very perceptible in the perinæum: the patient sits uneasily, and seldom passes urine without interruption and pain: the swelling either is in the back part of the scrotum originally, or extends that way. The patient, from long habit of observing his situation, can recollect that often while the urine flows in a full stream, he is sensible of some going into the tumour; and after having passed his urine, he can, by squeezing the swelled part of the scrotum or perinæum, press out a small quantity of u-



rine extremely foetid, from being retained in the sac: often, while the urine is flowing in a full stream, he finds it stop suddenly, from the presenting of one or other of the little stones in the proper course of the canal; and that there are such stones, he can feel distinctly, for as the stones are formed in the sac, and not the sac moulded upon the stones, the sac is large enough to let them rattle so against each other, that the patient feels them within the tumour, like those in the crop of a bird.

When such a sac is opened by an incision, stones are found in some cases to the number of sixty or eighty, and the fistula is nearly, though seldom entirely, cured: why such a sac is not easily cured is obvious, for the formation of so many stones implies a long continued disease and callosity of the parts; the sac is generated by pressure, distension, and successive inflammations; there is a remarkable thickening and massing together of the parts, and when the tumour is opened the surgeon feels, by introducing his finger, that the sac is so smooth, so lubricated, and so perfectly analogous with the inner membrane of the urethra, that it is probably a simple aneurism-like dilatation of that canal, supported by a thickening of the cellular substance; and the sac formed out of such a lubricous membrane is not likely to inflame and heal.

Perhaps it may not be irrelevant to mention here, among the diseases of the urethra, an accident which is shockingly frequent: little boys who in their dreams wet the bed, have often, to avoid the shame and the punishment of such a fault, tied tapes about the penis, and, unable to undo the knot in the morning, have concealed their situation; and I have known parents so fool-hardy as to do this, and have seen the penis cut half across. It is always the lower side of the penis, or that on which the urethra lies, which suffers; and the only remark which I have to suggest is this, that I have never seen any good done by attempts to re-unite the parts at the time of the injury. That the applications of cantharides, red precipitate, and other irritating applications, in place of assisting the re-union, or procuring granulation, have invariably widened the breach. I advise that the parts be suffered to heal; that if any thing be introduced into the urethra, it be only a leaden probe; and that all attempts at healing the breach, be deferred till the parts are skinned over, the inflammation entirely gone, the orifice callous; and then, by paring and scarifying the edges, retracting the skin of the penis, securing it by adhesive plasters, and introducing a flexible catheter, it may be readily cured.

These are accidents comparatively rare; to omit the mention of them would indeed be wrong, but to represent them as frequent causes of fistula, would be to deceive my reader: let us turn then to matters of daily practice.



That inflamed, indurated, and confused state of the parts, where the urine having ceased to flow through the natural canal, has burst through the perinæum in various irregular openings, is the work of time, and proceeds from the slow operation of some continued resistance to the passage of the urine: stricture, and venereal disorders of the urethra, are the only causes which we recognize in common practice. If the interruption of a stone passing along the urethra, or a blow bursting the canal, produce fistula, it is to be regarded rather as an accident, and indeed the disease is more easily cured. Stricture is, in ninety-nine of a hundred cases, the cause of fistula; for irritation and frequent desire to pass urine are inseparable from stricture, which is continually felt as a foreign body: the frequent contractions of the bladder lessen its dimensions, thicken its coats, and increase its muscular power; and thus, while the bladder is acquiring daily increase of power, and its contractions are becoming every hour more frequent, the urethra is no longer able to bear the pressure. I do not mean to say that the urethra is burst, as where a stone impacted in the urethra totally shuts the canal, but it is dilated by the continual force of the bladder, it inflames, the surrounding parts are soon affected, and thence begins the disease of the perinæum.

The penis, and all the surrounding cellular substance, are so dull and obtuse in their sensations, that though the former is the seat of a peculiar kind of sensibility, its diseases make great progress with little pain, and though stricture in the urethra, and abscess of the perinæum, are diseases of no slight importance, yet the fact is, that they steal upon the patient by such slow and insensible degrees, that he is hardly aware either that he is labouring under the one disease, or in danger of the other, before he falls into the most calamitous circumstances.

When fistula is first threatened in the perinæum, you may feel the callosity firm, knotty, and perfectly moveable, and you can move the urethra sideways, with the finger and thumb, as if the bulb were injected with wax; the pressure of your thumb squeezes out matter, which passes into the canal of the urethra, and issues from the penis; and such a tumour I have seen for many alternate days, almost vanish, then return again, and at last disappear; whence I am inclined to conclude, that such a small abscess or blind fistula, opening not outwardly, but only into the urethra, varies in size according to the quantity of matter contained in it, and sometimes is cured and obliterated.

From the time that urine begins to issue through openings in the perinæum, the disorder becomes every moment more complicated, and the condition of the patient more loathsome. When the urethra is obstructed anew, and the perinæum in-

flames, when either the old fistulas are about to burst out, or new ones are forming, the patient has distinct rigours and fever, and clouds do not more certainly portend a storm, than rigour and a feverish paroxysm, the generation of some new fistula. It is not a slight rigour that the patient is assailed with, but a cold fit like that of a quartan: the patient feels a sickishness, languor, and giddiness; his face grows pale, and the circle round his eyes livid; and when the fit comes on, the bed shakes under him, and his teeth chatter audibly. He vomits a profusion of bile; his urine is sparing and high coloured; his temples throb, and the hot stage which succeeds is very violent, and is followed by a sweating stage, very long and exhausting. He is bathed in sweat, shirt after shirt is changed, and is actually wrung out before it is thrown into the closet. The bed-clothes are thoroughly soaked. The fætor of the urine passing through the fistulous sores and wetting the linens, and the extreme frequency of passing water, and the imperfect manner in which it passes, the patient having hardly any degree of retension, make his condition most miserable. His frequent rising to take the water-pot during the night, while under this sweating-stage, gives him cold and aggravates every symptom. The patient, after each paroxysm, looks wan and meagre; he could not, in the space of several weeks, entirely recover from the shock, but weeks are not allowed him, for one paroxysm succeeds another at intervals of but a few days, bilious vomiting or diarrhœa often occupy the intermediate time, and the surgeon, with all his care to preserve his patient from fever, is hardly able to find two days free from fever, during which he may perform his operations. This is an intermitting fever so purely symptomatic, that bark or wine, or antimonial medicines, are of little use; the patient very generally cannot use laudanum, which only increases his sickness; nothing can give relief but destroying the stricture and opening the fistulas.

The catheter, if it can be passed or retained at such a time, is of use, by preventing the impression of the urine upon the parts; and extreme cleanliness, air, and exercise in a carriage, and the warm bath, with opiate clysters, palliate the distress till a fit time comes for attempting the cure.

When a patient commits himself to your care, look well to his condition, reflect maturely on every circumstance of his case, and weigh all the probabilities before you promise, or seem to promise, a cure; although he has been long labouring under disease, and the parts are in great disorder, though the perinæum be perforated with irregular openings, and abscesses extend from the urethra to the scrotum and hip, you will not despair; because, these points are accessible. But when the cel-

lular substance of the pelvis is deeply affected, when flatus bursts through the several openings, demonstrating that they penetrate to the rectum, though you will never abandon the person who puts his confidence in you, you will be cautious how you express your hopes of saving him, to his friends.

This is so entirely a surgical disease, and the parts are so irregularly affected, that natural ingenuity and a spirit of enterprise are of infinite use, and a nice and careful hand in adapting instruments to the condition of the parts, and laying dressings so as to keep the sores dry and clean, sometimes perform wonders. The surgeon sits down to reflect deliberately on the causes of the fistulas, and of their various directions and communications, he passes first the catheter or bougie into the urethra, to feel for the obstruction, he probes each fistulous opening, to discover its depth and direction, and its communication with other openings, and to observe whether the probe, when passed through the fistulous openings, and the catheter where it is stopped in the urethra, can be made to meet.

He examines carefully into all the circumstances of his patient's case, that he may know in what succession the several openings burst out, and in what degree the parts have suffered. He then tries to get the staff, if possible, into the bladder, introducing his finger at the same time into the anus, that he may be assured whether there is any disease within the pelvis, and beyond the reach of his knife. On the clearness of his conceptions and reasoning, does the fate of his patient entirely depend; the stricture is to be relieved, the fistulas laid open, the canal made direct and clear, and the incisions healed by escharotic applications: and, while no diseased part is to be spared, no part, either of the urinary canal, or surrounding integuments, is to be wantonly destroyed. In short, care and cleanliness, ingenuity and industry, a perfect knowledge of the anatomy of the parts, and a mechanical genius for contriving various means of restoring the passage of the urine, and healing the openings, are of inestimable value; they are talents which may be improved and cultivated, and will eventually save the lives of patients, who, if laid in a foul bed, and macerated in relaxing poultices, would die.

Fortunately there is no doubt nor delicacy concerning these operations on the perinæum, which seem so cruel, and which are indeed so often unsuccessful; the natural force of the urine never could overcome a stricture in the urethra, and the perinæum being perforated, even that ineffectual force is taken off, the parts are running every moment into greater disorder; the most vigorous health (and that is not to be expected) can never cure those sores, while the obstruction in the urethra remains;



the suppurations are continually spreading, and the fever increasing, so that something must be done, and since that part of the urethra which lies betwixt the stricture and the point of the penis is now of no use, we may proceed to remove the stricture, and since the urine has a free issue by the perinæum, we are not interrupted in our work.

These general theories of the disease and of its cure, are of use to give the surgeon clear conception of the difficulties he has to encounter; but that he may learn how to encounter them, I shall proceed to lay down rules for his conduct, in somewhat of an aphoristical form.—1st, It is not here as in the case formerly described, (*viz.* a sudden bursting of the urethra,) the first duty of the surgeon to make free openings in the perinæum; for the walls of a fistula are so condensed by inflammation, that the urine is not injected into the cellular substance, but flows through one or many openings, whose walls are firm and tube-like, as the name fistula implies. The first care then of the surgeon, in every case of fistula, whether old or recent, is to clear the canal, and that is best done by passing a caustic bougie down the urethra. If there be plainly a stricture in the urethra, if the bulb or lower parts are just beginning to give way, and the perinæum to inflame, let the caustic bougie be applied immediately; or let the common bougie be forced into the stricture, to procure a momentary relief, by freeing the passage and relieving the perinæum from its immediate pressure; while leeches and saturnine solutions are applied to the perinæum, and the part supported with gentle pressure. Sometimes in proportion as the passage is cleared by the caustic, the pain and swelling of the perinæum subside, and the patient is saved from a breach in the urethra.

2d. When the disease has proceeded a point farther, and there is not only an inflammation in the perinæum, and a threatening of danger, but an actual abscess; the surgeon should make no delay, but open it: there is indeed no danger of the urine being diffused widely under the skin, but there is danger of the abscess extending itself, of more cellular substance being destroyed by suppuration, and of the urine being admitted into a larger sac; in short, the abscess in perinæo will always be more or less extensive, in proportion as it is more or less prudently managed; and it is a point of prudence to open it early. If it could be prevented from suppurating, that would be a great point; but, when it has already suppurated, and points to a head, when you distinctly feel the matter, and suspect, from circumstances, that the urine has access to the abscess, you open it without loss of time, with the point of a lancet; and at the same time, take every measure for freeing the natural passage.



3dly, In cases of irregular and complicated fistulas which have continued long, when little urine passes by the urethra, and much through fistulous openings, become callous by time; where there is no threatened disease which may be prevented by timely incisions; where either the surgeon feels plainly one long and formidable stricture, or suspects various openings in distinct parts of the canal, he will first give his whole attention to the clearing of the natural passage, that he may afterwards deal more successfully with the fistulas.

His means of overcoming such strictures, must be adapted to the circumstances of each. If he has reason to believe that there is but one small and solitary stricture, he will perhaps hope to give a temporary relief, by forcing the point of a bougie into it, and thus, for a moment, taking off the force from the perinæum, he may gain time for the use of the caustic, and be able in a more deliberate way, to destroy the stricture altogether, and restore the free stream of urine. If, from the history of the complaints, and a distinct account of what has been done by former surgeons, if from the entire obstruction of the urine, from the extensive fistulas and long continued disease in the perinæum, he has reason to believe that the stricture is very compleat; but especially if upon feeling the urethra, he is sensible that the obstruction arises, not from a single stricture, hard and round like a pea, at one point of the urethra, but from several contiguous strictures occupying a considerable length of the urethra; if, to speak more accurately, he feels with the finger and thumb, a space of the urethra, nearly half an inch in length, small and hard, like a big thread, at which the bougie or catheter stops, he has reason to fear, that not a hundred applications of caustic would destroy such a stricture, and is sensible that he must have recourse to rougher methods. He introduces the stalk of a silver catheter, the bend being cut smoothly off, and using it as a canula, he plants the point of it upon the stricture, and passing down a trocar or piercer, either squared or lancet-pointed, and grasping the urethra firm in his left hand, and holding the piercer firmly with his right, he bores it along, (a thing which cannot be done without much force and exquisite pain to the patient) and makes his way through the stricture, indifferent whether it passes through the body of the stricture or by the side of it, if only it meet the open part of the urethra. This operation I hold to be chiefly practicable in strictures manifestly of considerable length, and occupying the middle parts of the urethra, especially that which lies within the scrotum; and I have found the operation greatly facilitated, by feeling very carefully from the point where the catheter stops, so as to ascertain the extent of the stricture,

making the patient in the meanwhile press his urine, so that I would feel the urethra dilated into a sort of sac, behind the stricture. This sound and dilated part of the urethra is that which is to be aimed at with the trocar: I have found it necessary to hold the urethra and penis particularly firm, for it requires great force to drive the piercer on: and in this operation of working the urethra along the piercer, as you would put the bait on a fishing-hook, I have, I confess, found the greatest difficulty in hitting precisely the free and dilated part of the urethra behind the obstruction. The lancet-pointed trocar, is, I am certain, from experience, preferable to the round or square pointed trocar, and I think it necessary to mention, that generally and almost necessarily, the trocar must enter the side of the sound part of the urethra, whence there will be a degree of crookedness in the new canal; and if there be any collateral abscess to distort the urethra, the irregularity will be very great, and the catheter will pass this point with a degree of difficulty, and not without some address on the part of the surgeon, who must learn, by practice, towards which side the obliquity lies. To prevent or lessen this, to preserve as far as possible, a direct channel, a large leaden probe as big as the catheter should be worn during the cure, and the caustic occasionally used: this operation of perforating is, I acknowledge, difficult and delicate, but we speak now of cases where bougies are merely a torment, and the caustic ineffectual.

This stricture in the middle of the penis, is usually accompanied with strictures equally formidable near the bulb, the immediate cause of the fistula. These are to be cut with the knife, rather than cauterised, for the fistulas of the perinæum lead directly to those lower strictures, the probe or directory passed to the bottom of the fistula, touches this point; and when the fistula is to be laid open, though it would be wrong where there were no breach, to approach the urethra, it is good practice, when there is an opening in the urethra, and that callous, to make that opening a part of the incision; to pass the staff down till it is stopped by this lower stricture; to pass the directory along the fistula, till it almost touch the staff; to observe well the direction of each, and to cut along the directory till the staff is laid bare.

4th, To attempt any surgical operation on the perinæum, before the free course of the urine is restored, would be but loss of labour, and a wanton destruction of parts; and the moment that the canal is free, the urine, no longer disordering the parts, they shew a tendency to heal, while the bladder itself seems to recover its powers. I have seen a patient, whose incontinence of urine was such as to wet the bed incessantly, and

lead me to suspect that the body of the bladder itself was perforated, so relieved, by cauterising or perforating the stricture, that he has retained his urine from night to morning, and from morning till night, passing two pounds at once. When the operation of the caustic is compleat, the stricture perforated, or the free course of the urine, by any art restored, the surgeon addresses himself to the new and arduous duty of healing the sores, he performs now on the fistula in perinæo, the same radical operation that he would on the fistula in ano, i. e. he lays it compleatly open. He places the patient as for the operation of lithotomy; examines all the openings once more with the probe, and sounds their depth, and remarks their relation to the urethra. He then introduces the staff down to the stricture in the perinæum, and gives it to an assistant to hold; he next passes the grooved directory, perhaps a little bent, along the main channel of the fistula, till it reach the stricture, and almost touch the staff; he then either runs his sharp or probe-pointed bistory, as he thinks best, along the directory, or he cuts with a common scalpell, till he at once lays open the fistula and cuts the stricture, making it the last part of the incision and nicking it fairly. He has now laid some length of the staff naked, but, to be assured that the stricture is compleatly undone, he pushes the point of the staff through the incision of the perinæum and then passes it into the bladder. He then withdraws the staff, and introducing the flexible catheter, or a leaden staff, dresses up the incisions lightly, and perhaps orders a warm stimulant fomentation of chamomile decoction sharpened with sal ammoniac to be laid over the parts and repeated from day to day to keep them clean and in a pleasant state; and though the circumstances of the case should have forced him to lay open a considerable length of the staff, he need not be dismayed, for we frequently see several inches of the urethra (I have seen full three inches of it) regenerated, or rather replaced, from the growth of the surrounding parts.

In the future dressing, though I do not altogether forbid the occasional use of poultices, I do not approve of their being continually applied, the warm bath or stimulant fomentations are much to be preferred, while the parts will always be found most healthy when kept dry and clean. The sponge and lint are the best dressings. The callous parts may be touched with caustic; and when the granulating process languishes the parts may be animated with red precipitate mixed with basillon; spirits of turpentine, when not applied too widely so as to parch the parts, but touched on with a hair pencil, is often remarkably useful; and, the alternating these stimulant applications with poultices, is particularly useful, for the occasional

use of a poultice which, if continued, relaxes and indisposes the parts, swells them, increases their sensibility, and exposes them to the operation of the turpentine or precipitate. Never let such sores be crammed even with lint, far less with stimulant dressings, but let the dressings be laid on lightly and retained with a (T) bandage. The flexible catheter, if it can be retained, promotes the cure greatly by saving the parts from the excoriation of the urine; but it is not to be imagined that the lodging of the catheter within the bladder prevents altogether the urine tainting the parts, for every time the bladder acts (and it acts more frequently and more irresistably when stimulated by the catheter) the canal of the urethra dilates so, that while much of the urine flows through the catheter, some passes by the side of it and issues at the perinæum.

The bathing the parts with salt-water contributes to prevent the itching and preserves them cleanly and granulating, and the use of sea-bathing and exercise often contributes to the final cure of sores which seem altogether callous; but it is not to be concealed that often, after the cure of the great fistula, and when the perinæum seems entirely restored to a healthy state and the urethra to be free of obstruction, one small point continues perversely open, and can by no means be healed; and the circumstance of the patient being now restored from the most melancholy to a comfortable situation discourages the surgeon from making any new attempt.

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## DISCOURSE XVI.

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### OF TOTAL OBSTRUCTION OF URINE, AND THE OPERATION OF PARACENTESIS VESICÆ.

#### SECTION I.

##### *Preliminary Observations.*

**I** SHALL conclude this subject with the description of a desperate operation, which is yet our sole resource in the last stage of misery. The operation of paracentesis is less frequently resorted to as the means of saving the lives of young and im-



prudent people ; it is more commonly resorted to as a means of prolonging the years of the aged and infirm. When in a young and otherwise healthy man it happens, that by a blow or fall, the perinæum is injured ; or when, from a neglected stricture and a sudden suppression of urine with fever, it is necessary to perform the operation of paracentesis vesicæ, the scene is very distressing ; but when in a man far advanced in years, the prostate gland has been long diseased and has occasioned frequent obstruction ; when, at last, the bougie gives no relief, and the catheter cannot, even with any degree of force or rudeness, be driven into the bladder, the scene is not less affecting, for this swelling of the prostate is a disease almost peculiar to learned and sedentary men ; and the patient's age, infirmities, and present sufferings ; the dignity with which he supports them ; the presence of his family depending perhaps on the survivancy of his offices, and the melancholy dispersion of his family, which must follow his death, create a strong sympathy. His genius and literary talents give us a particular interest in his fate ; the operation is, it must be acknowledged, but a temporary resource, yet such a man can bear to linger on a little longer, and, with his family around him, think it happiness.

It is not possible to refrain from alluding to a melancholy scene, which returns too often not to leave serious impressions, and it is most natural to feel some degree of anxiety in trying to resolve many doubts concerning the proper conduct of the surgeon in circumstances naturally perplexing ; where the chief masters in surgery deny us the benefit of their advice and counsel. " I must own," says one of the first surgeons of our own country, " that I have not seen cases enough to enable me to give all the varieties that occasionally happen, and, of course, all the advantages and disadvantages of each method." But are those who presume to teach, entitled thus to decline giving their best advice because every such case is full of difficulty and danger ? Is it fair thus to devolve the most difficult questions in our art upon the individual surgeon perplexed at once by the delicacy of his situation and the selfish reserve of authors, whose province it is to lay down the plain line of his duty ? Whatever presumption there may appear in offering to explain a subject which has been declined by so great a master in surgery as Hunter, I cannot but reflect that this is an operation which may eventually fall to the lot of every surgeon to perform : that nothing could be more ungracious on the part of a teacher than to devolve on every young man the difficult task of going unassisted through a long process of reasoning upon the choice of instruments or methods, attended with the imminent risk of think-

ing too long, or of acting too rashly : I cannot but recollect that the young surgeon coming unprepared to such an operation, may make his incisions in the perinæum deep and wide, and yet miss the bladder, and find no better way of retrieving his error than by performing a second operation by incision above the pubis : I have seen this, and, to my utter amazement, have seen a patient so mangled, survive.

## SECTION I.

*Of Distention and Rupture of the Bladder.*

When we speak of the over-distension, and of the bursting of the urinary bladder, as cause and effect, we are guilty of a palpable solecism ; nothing, I believe, can be more easily proved, than that the bladder never is so distended, as from mere extension, to give way ; it is not burst by dilatation, but is inflamed, becomes gangrenous in one spot, and then yields.\* If the bladder can be so distended, without rupture, as to contain ten pounds of urine, if it be so distended as to compress the intestines, fill the whole abdomen, and rise to the scrobiculus cordis, without rupture ; if it be thus distended by the third day of the suppression, and yet continues entire to the eighth or tenth day ; if the urine begin to be slowly discharged from the third day, so as to prevent any farther accumulation, how can it be that it gives way from mere extension ? The expression *over-distension and the bursting of the urinary bladder*, is so common, and yet so deceitful, that I hold it right to say a few words on the dangers of distended bladder, which will at once explain the difficulty.

The urinary bladder, which naturally holds a pound and a half of urine, is no sooner dilated so as to contain two pounds, than uneasy sensations are experienced : the desire of passing the water is very strong, and if the desire be not gratified, if the bladder be suffered to be dilated beyond its natural state, it loses all power, and becomes paralytic. The desire indeed continues, and the efforts are renewed in painful paroxysms, with impatience and violence, but the power is gone, and the bladder continues distending more and more.

When it becomes so enlarged as to fill the whole abdomen ;

\* Either the neck of the bladder, or the beginning of the urethra, certainly ruptures in some instances ; in consequence of which, the urine becomes extravasated in the perinæum. The impression on my mind is very strong that I have seen bladders evidently lacerated from over distension. S.

when it reaches the *scrobiculus cordis*, and can rise no higher; when the distension is at its extreme, and neither the bladder nor the space in the abdomen can receive more, the general pressure acts like an expulsatory power, and one of these things must happen: either the bladder must give way and lacerate, which it never does, so equally is it supported by the pressure of the surrounding parts; or its orifice must dilate, and the urine begin to flow. The urine actually begins to flow from the third day of the suppression, and whatever urine descends from the kidneys is evacuated in small quantities from time to time.

Now this gradual and dribbling evacuation of urine, which empties the bladder, which begins with the full distension of it and continues till the eighth or tenth day, or till the bladder yields, has been long understood by good surgeons, and has been especially named by the French writers, "*Uriné par regorgement*." This evacuation of urine, proceeding from overdistension, is most dangerous and deceitful. The friends felicitate themselves that the urine begins to flow; they communicate their information to the physician, which he is too apt to believe; basins and cloths wet with urine are easily produced, but the patient lies unrelieved; and the continued distension of the bladder is followed by universal inflammation of the abdomen: the insensibility and low delirium of incipient gangrene, are mistaken for that relief which was expected from the flow of urine, till either hiccup comes on, and the patient dies of fever and inflammation; or the urinary bladder actually gives way, and the acrid urine is poured out into the cavity of the abdomen. Cases innumerable of this description are to be found in the writings of the older surgeons; the quantity of urine corresponds so well with the quantity of drink, that the physician is apt to be deceived; and Colot tells of many cases in which, while they believed this *overflow* of urine to be an incontinence, they actually mistook the distended bladder for an abdominal abscess, and made appointments to open it by incision.

Let no surgeon then trust to the reports of nurses or friends, nor partake of their inconsiderate joy, but lay his hand upon the abdomen and tap with the finger, that he may distinguish the distended bladder and the fluctuation of the urine.

Since then the bladder suffers no farther distension from the third day, why should it burst? Not from laceration, for it is supported by the uniform pressure of the surrounding viscera, and the general tension of the abdomen: not by yielding suddenly, for it is distended to its utmost on the third day of suppression, and yet seldom gives way before the tenth: not by at-

tenuation, as a substance merely elastic gives way fibre after fibre, or bursts suddenly, for the bladder, even more than the womb, increases in thickness in proportion as it is distended. The term laceration never was more unfortunately applied than to the bladder; for when there is a breach in it, we find upon dissecting it to be a *small* round hole, such as might be covered with the point of the finger; it is round like a shot hole, with a rough and ragged margin, in short, the rupture is at a single spot, not longitudinal, but circular; the bladder, and all the adjacent viscera, are red and inflamed, while this single point is black and mortified.

The signs of death are not merely similar to those of protracted labour or strangulated hernia, but are essentially the same, as proceeding from the same cause. While the bladder is distending, the abdomen feels hard and firm, and the tumour is circumscribed in the hypogastric region: when the bladder reaches the scrobiculus cordis, the symptomatic vomiting comes on, the pulse becomes rapid, the belly becomes extremely sensible, and the patient cannot endure the gentlest touch: and soon, the particular swelling of the bladder is concealed, because the abdomen in general becomes tumid and elastic, like a drum, while the pulse becomes frequent and irregular, the mouth is parched, the face ghastly, and the extremities cold; and when after a period of insensibility or low and muttering delirium, the patient expires, we find, upon dissection, the bladder deep coloured, of a dusky red, thick and fibrous, or fleshy: often the bladder has formed adhesions with the surrounding parts, and the viscera of the abdomen are very generally inflamed before actual gangrene comes on, or the bladder gives way, and the patient usually expires thus, not of rupture of the bladder, but of fever, irritation and suppressed discharge. But when the bladder has actually yielded, its rupture is accompanied with a sense of something giving way within, and we find that the opening is in the centre of the fundus, in one round gangrenous spot,

To those who imagine that the extension of parts in the living body, is like that of the dead, an attenuation or mere dilatation! who expect to find the bladder, upon dissection, thin and transparent! its real condition must appear very surprising. The bladder has not indeed time to grow by an actual deposition of parts, but it is thickened by the fulness and turgescence of its vessels, and by extravasation into its cellular substance. I find always the veins extremely turgid, the muscular fasciculi big, fleshy-like, apparently injected with blood, (as in a preparation where the bladder is injected with size, till the size is extravasated among the coats). And while much blood is extravasated



into the cellular substance of the coats of the bladder, some exudes into its cavity, thence the urine is always deep coloured, obviously tinged with blood, and the last pound of urine drawn off, either by the catheter or trocar, from a distended bladder, is as thick and as deep coloured as coffee-grounds, tinges the instruments black, and is extremely foetid. The slow and gradual distension of any living part is invariably accompanied with actual growth or a secretion of new parts; sudden extension is accompanied only with a turgescence of vessels, a fullness of blood in the part, and an extravasation into the cellular substance: inflamed viscera, have always from this extravasation, a livid appearance: a strangulated intestine, and a distended, and consequently inflamed bladder, resemble each other in this respect, and though such parts seem gangrenous, yet, upon macerating them in water, the blood being washed out, they resume their natural complexion.

That these several stages of dilatation of the bladder may be exemplified, I shall briefly recapitulate the circumstances of such a case: A woman having fallen in labour on Saturday morning, the head of the child descended into the pelvis, the pressure on the urethra prevented any urine being discharged, the head descended lower and lower, till the scalp appeared, on Monday, protruding through the orifice of the vagina. In this state of suffering the woman was permitted to remain till Tuesday evening, when she was delivered. During four complete days the pelvis had been so occupied by the head of the child, that the urine could not be discharged.

The catheter was never introduced, nor did the medical attendants make even the slightest inquiry into the state of the abdomen: the nurse, when changing her linens, after delivery, was sensible of an unusual degree of fullness, and the patient expressed her desire to pass her urine, but she lay down, the desire returned again at the distance of two hours, and then she passed about a pint of urine, next day she suffered much from pain in the abdomen, with frequent desire to make water, which she discharged in tea-cup-fulls. On Saturday, (the eighth day of her distress) the physician who attended her was again called: her belly was now greatly distended, with great torments, difficulty of breathing, and oppression, an intense thirst which she durst not indulge, fever, furred tongue, and very frequent pulse: about an hour before his visit, she felt something *within, at the navel, crack*, with great pain. For thirty hours preceding this she had made no urine, nor did she pass one drop from that time forward. A few ounces of very foetid and dark-coloured urine were now drawn off by the catheter, and on the second day after, she died delirious. The abdomen was found,

upon dissection, universally inflamed: the bladder had given way, and the opening was found to be in the centre of the fundus, of a circular form, and with a black and gangrenous margin.

Obstructed urine, hernia, and lingering labour, resemble each other so entirely, that in each case the same signs indicate the same danger. In the common fate of the patient those three cases unhappily agree but too well; **DELAY IS THE GREATEST DANGER,\*** and perhaps I have not, in this book, announced a maxim of more importance than this! I entreat the young surgeon to beware of delay. In suppression of urine it is most painful to see that the needful operation is usually performed too late, that the patient's resignation avails him nothing, and that the dexterous operator has no reward for his skill and dexterity. In these three cases it requires talents, experience, and a spirit of observation, to conduct the patient safely: to give a fair chance of relief from the powers of the constitution, without exposing the patient to danger, by delay: to decide whether in cases of retension of urine, the abdomen be still uninflamed, so as to allow time for the good effects of fomentations, poultices, with a variety of trials, to force the passage? or whether the danger be not pressing, requiring the bladder to be relieved at every risk, either by forcing the catheter violently through every obstruction, or by piercing it with the trocar? This I am well assured of, that there is no mode of operating, no kind of danger equal to that of delay. It were better that the surgeon cut into the bladder by any cruel method! better that he cut above the pubis, or make his way by incisions in the perinæum, after the manner of the lateral lithotomy, than to delay the operation one hour beyond that in which the signs of inflamed abdomen manifest themselves; for, after the rudest operations, the patient sometimes survives, but from delay thousands have been lost. It is, I believe, the opinion of all good writers, the maxim respected in all æras of our science, the fair deduction from all the fatal or prosperous cases on record, that we should, in retension of urine, as in hernia, operate early.

But while I speak thus the language of conviction, and repeat the injunctions of the most experienced of our profession, I cannot be without some anxiety, lest the young surgeon should be led into rash measures. I know it to be true that few have

\* This maxim is undoubtedly correct where the operation is or will be necessary; but this is so seldom the case that in ten years Default performed it but once, in the Hotel-Dieu, of Paris; and even in that instance, he afterwards thought it might have been avoided. Mr. Abernethy is of opinion that the operation is rarely if ever necessary, that the remedies above mentioned will, in almost every case, procure a discharge of the urine. S.

suffered by precipitation, such is the natural aversion to operations, and the reluctance of friends ! while in my own limited practice I have seen many victims to timid measures and operations performed too late ; yet I am inclined to trespass with one observation more, which may serve to qualify the opinion I have laid down.

Although the greatest danger is to be apprehended from inflammation of the abdomen, yet the whole aspect of the case is not to be ascribed to this cause : the low delirium, trembling pulse, or even hiccup, do not portend death in distension of the bladder so absolutely as in a gangrened limb : these are not always signs of internal gangrene, often they manifest themselves while the parts continue sound : nor does every degree of swelling of the belly, vomiting, and faintness, infallibly indicate abdominal inflammation : many of the worst signs proceed, in some degree, from mere irritation, and the patient's exhausted state. In retension of urine, the fullness of the bladder and suppression of the natural discharge, the tossing and misery of the patient, from desire to pass urine, and the ineffectual endeavours to introduce the catheter, exhaust him, and he seems in the last stage of the suppression, to lie almost in a comatose state. In short I have, in the course of my practice, observed that in all these cases delirium comes on very early, in consequence of the pain, fever, and want of rest, for many days and nights. The inference then is plain : that though in such cases nothing but operating can save the patient's life, we never must so far prejudge the question, as to say he is beyond the reach of art ! Every surgeon of experience must have observed, that in dangerous distensions of the bladder, the abdominal pain ceases, the pulse subsides, the tossing of the patient, and all the signs of indescribable uneasiness, vanish as soon as the catheter or trocar is forced into the bladder : after those several operations, the delirium goes off, the senses become clear, the fever abates, and the natural sleep is restored.

In short, the worst signs are no sure proofs of gangrene ; the patient is perhaps exhausted with sickness, irritation, and pain ; we never must prejudge the question, saying, " It is surely too late to operate." IN THE MOST HOPELESS CASES, LET THE PATIENT HAVE HIS CHANCE FOR LIFE.

And now that I am to analyse the several operations, and teach that which is fittest in the several circumstances to be performed, I shall say a few words on a subject of some delicacy. The talent of operating is not merely useful, as enabling the surgeon to perform safely, a dissection which is not without danger, but still more in giving him perfect possession of his own mind. The degree of skill we have or suppose ourselves

to have, in operating, enters, I fear, too much into our feelings, when considering what is best to be done ; for, in difficult circumstances, a man timid and unskillful in operation will be apt to linger and hesitate ; a man bold and conscious of operating well, especially if not familiar with practice, will be apt to hurry on with precipitation, to the most decided measures ; but a man who is familiar with scenes of this nature, and has both performed many operations, and has studied well the prognostics of danger or safety, will, if he be at the same time a fearless operator, proceed at once with resolution and caution, will neither hurry, nor delay too long, the measures which he thinks necessary for the patient's safety ; and though no modest nor ingenuous man will ever, upon a retrospect, be entirely satisfied with his own conduct, even when most successful, yet one thus qualified at once to reflect deliberately, and act intrepidly, will, upon the severest scrutiny into his past conduct, find little reason for self-reproach. I do regard skill in operating as of the utmost importance in giving the surgeon perfect self-possession : a bad operator will hesitate, in the most simple cases, while a good and dexterous operator, like a man skilful in the use of weapons, will not enter rashly into difficulties, but being engaged from conviction, will bring himself through with courage. Let every young man then endeavour to become a DEXTEROUS OPERATOR, for that will help to make him a JUDICIOUS SURGEON.

## SECTION III.

*Of the several Methods of puncturing the Bladder.*

If we are entirely in any case to join pathology with surgery, to reason from the constitution and nature of the parts, and from the acknowledged dangers of operation, to any practical conclusions, it must be in the present case, where innumerable dissections instruct us in the causes of death. Having established the fact, that in cases of retension of urine the patient dies from no other cause than inflammation of the abdomen, let us see what assistance this theory will give in deciding the main question, "Which is the least dangerous method of tapping the bladder?" First, If we make our incision above the pubis, and strike the trocar from that point into the bladder, we cut parts contiguous to the peritonæum already inflamed. Secondly, If we cut from the perinæum, with incisions resembling those of lithotomy, we make deep, unnecessary wounds in a part of the bladder which, though lodged in the pelvis, sometimes extends its inflammation, as in Chesselden's first experi-



ments, to the cavity of the abdomen. Thirdly, If we strike the trocar skilfully into the same part into the perinæum, without such preliminary incisions, the risk of inflammation is greatly lessened; and if we pass the trocar from the rectum into the bladder, we carry it through no thickness of parts, but transfix only two membranes: it is "like a stroke in the water:" and the danger of inflammation is exceedingly small. This slight index of the principles, according to which I mean to reason, will enable my reader to accompany me in the following critical review of the several methods of operating: perhaps it will enable him to anticipate many of my conclusions; it will surely incline him to adopt a mode of puncturing the bladder very different from that in common use.

#### FIRST METHOD.

The most common operation, because the most obvious, is to penetrate from above the pubis. Every ignorant tyro, though unable to strike the bladder from any other part, is able to plunge the trocar into it, at a point where he feels the fluctuation so plainly: that superficial objection of the danger of wounding the peritonæum, so often urged against this method, is indeed of no importance; there is no danger of wounding the peritonæum, for the bladder, when greatly distended, reaches high above the navel, carries the peritonæum, of course, before it, and exposes a space of several inches, in which we may perform our incisions without incurring this kind of danger. But the abdomen is inflamed; the preliminary incisions, which prepare for the introduction of the trocar, pass, in a gross old man, through several inches of fat and cellular substance: the incisions must be wide in proportion to their depth: the canula is no sooner lodged here than it is displaced, in some degree, by the contraction of the bladder, which, when emptied, subsides under the pubis: the canula stands so obliquely that the urine never flows with ease but by running out upon the wound, and by being injected among the cellular substance, it causes the wound to inflame, the wound, by its proximity to the inflamed peritonæum, soon mortifies, and thus, notwithstanding the temporary relief produced by the emptying of the bladder, the patient dies on the third or fourth day.

Those who have been forced by fatal experience to condemn the puncture above the pubis, have entered into no investigation, and have not always been able to assign a cause for their ill success; but it is well known that the wound is apt to gangrene, the operation is so easy that nothing but experience of its ill consequences could prevent its being universally preferred.

red: but the unfavourable issue of the operation is now so universally acknowledged, that even the difficulty and deep incisions in the perinæum are preferred.

## SECOND METHOD.

To perforate the bladder with a trocar, from the perinæum, after making incisions, like those of lithotomy, is the sole method now mentioned in systems of surgery, a harsh, cruel, and dangerous operation. For when the surgeon is to make "*incision in the perinæum, an inch and a half in length, at the commencement of the membranous part of the urethra, and continuing it towards the anus in a line parallel with, but at least half an inch distant from the raphé perinæi!*" he has to operate according to precepts so inconsistent with the actual relations of the parts, so unintelligible to one who is an anatomist, and so nugatory to one who is not, that he must cut at random: having made deep incisions in the perinæum, he no sooner begins "to search for the bladder with his finger in the bottom of the wound," than he directly encounters the enlarged body of the prostate: If he understands what he feels, and dissects backwards till he distinguishes the bladder itself, he actually reaches that part of the bladder which lies upon the rectum; (viz. the space betwixt the visculæ) he arrives exactly at the same point which he touches in perforating from the rectum, and no one will deny that he might perforate with more security and less pain from the rectum, through its thin walls, than from the perinæum by these incisions: But, having made his way to the gland, he points his trocar (which is usually too short for any purpose, and not at all appropriated for this) directly upon the gland, drives it deep into its substance, and no urine flows, or flows only when both trocar and canula are withdrawn.—How this happens it is not difficult to conceive: "An old man who, for the last twelve or fourteen years of his life, was subject to occasional difficulty, was at last affected with entire suppression, so that for five days preceding the operation, he had not passed one drop of urine: all attempts to introduce the catheter, or give relief by passing bougies, were in vain, the tumid bladder was felt above the navel, he had continual straining to avoid his urine, with sickness, thirst, and a feverish pulse. But in his disease, nor in his present distress, there was nothing peculiar or worthy of notice. A young surgeon performed the operation of puncture in perinæo by all the usually prescribed rules. After dissecting into

the hollow of the pelvis, he struck his trocar deep, but upon withdrawing the stillet, no urine flowed, it was only when he was withdrawing the trocar also, that a little urine run out; nothing intimidated by this ill success, he struck his trocar once more, now the urine flowed freely; the canula was left in its place, the urine continued to be discharged, but the abdomen inflamed and the man died."

"Upon dissecting the body, the first thing that could be observed was the fundus of the bladder hanging flaccid upon the point of the canula, which projected some inches into its cavity; upon opening the bladder, the canula was seen in its place; upon withdrawing the canula and cutting out the parts from the pelvis, laying them on the dissecting board, and investigating the inner surface of the bladder, not the slightest mark of puncture was to be found; so that had not the trocar been seen in its place, upon opening the abdomen, no one could have believed that it had penetrated!"

This case I noted down as peculiarly instructive; an operation essentially bad was performed in a manner so rude and barbarous, that a coroner's inquest might have taken cognizance of the affair: This culpable homicide was a consequence of the same ignorance of anatomy, which makes many an operation for the stone miscarry: There is no wonder if a surgeon who would, if he were cutting for the stone, nick the urethra several times before he was sure of having divided it, strikes his trocar twice before he punctures the bladder: This gentleman directly encountered the diseased prostate without knowing it! He not only plunged into its substance, but that transversely, so as to transfix the gland; for the point of this canula being buried in the farther side of the gland, no urine flowed when he first withdrew the stillet! but while he was withdrawing the canula, after he had drawn its point from the farther lobe of the gland, and before it was withdrawn altogether, it received, in passing from side to side, a few drops of urine which flowed out: The second time he struck in his trocar, it neither passed deep behind the gland, which is the proper intention in this method, nor into the substance of the gland, and through its thickness into the cavity of the bladder, as usually happens, but directly onwards in the line of the natural canal, first through the urethra, and then through the centre of the gland. Thus it happened, that, after death, no wound of the trocar could any where be found; as for the death of the patient there cannot be a matter of wonder.

There is no more heinous fault than that of practising surgery without a knowledge of anatomy, unless it be that of studying anatomy independently of pathology, and applying the descrip-

tions of parts in the sound body, to the same parts in a state of disease. The effect of the enlargement of the prostate gland, upon our operations, has (as I know by fatal examples) been but little studied. The plan 1st, of enlarged prostate is very simple, I have represented in a true drawing the enlarged prostate which in truth fills all the lower part of the pelvis, and presents itself to the surgeon, so that without a perfect conception of its form, and actually feeling it with the finger, he can perform no operation without blundering. The extent of the enlarged gland is designated by the figures (a a a); the contracted bladder (for it thickens and corrugates in proportion as the gland grows) is marked (b b); the membranous part of the urethra is marked (c); while the original and natural size of the prostate is marked in dotted lines; and let it be observed that as the gland enlarges, the space (d) betwixt the ureters and vesiculæ seminales of the two sides, is increased; by being removed from each other, they leave a wider space open to the puncture of the trocar, so that they cannot be wounded, and though it were not so, the wounding of the vesiculæ, though it has been represented as a mighty objection to the puncture from the rectum, is none: the vesiculæ would heal as easily as any other part, and the vasa deferentia would reunite (unless indeed they were cut across), as easily as the bladder reunites, but this is a question of no importance, the operation is performed in people advanced in years and ruined in constitution, and the question is not about saving the organs of procreation from any slight injury, but about saving life. The plan 2d, presents the same parts in a vertical section. The staff is stopped at (a), in the membranous part of the urethra, by a stricture. The gland (b b) is represented as enlarged, filling the lower and fore-part of the pelvis, and compressing, in some degree, the rectum.

That the surgeon can hardly perforate behind the diseased gland through the body of the bladder itself, except by a very deep and dangerous dissection, is what I have always conjectured, when observing the size of the diseased gland; every operation I have since witnessed has contributed to strengthen a suspicion, which has been absolutely confirmed by a miscarriage more extraordinary and less pardonable than that which I have just mentioned; for though it is unpardonable to begin the operation by incisions in the perinæum, without introducing the finger in ano, to feel the condition and size of the gland, yet nothing can exceed the folly, in actually perforating from the rectum, of having the finger introduced for the purpose too of guiding the trocar, without estimating the extent of the gland, or choosing a trocar sufficiently long.

A gentleman being resolved to practise the newest piece of



*Plan 1. diseased. Prostate.*



*F. Kearny. Sc.*

*J. Bell. del.*



surgery; viz. puncturing from the rectum; used, in spite of every remonstrance on my part, a common trocar, hardly more than three inches long! a common trocar for tapping the belly in ascites! The consequence was most lamentable, for the instrument being buried in the substance of the enlarged gland, not one drop of urine flowed; the trocar and canula were both withdrawn, and the operation of puncturing above the pubis performed.

### THIRD METHOD.

In tapping the bladder from the perinæum without previous incisions, the puncture is performed on the broadest part of the bladder, where it lies under the arch of the pubis: the point of the trocar enters about the level of the urethra, where there is little of the diseased gland; to hit the bladder, not from behind the gland, but from its fore part thus, is as easy as to plunge into its fundus from above the pubis: no tyro could miss the stroke; if the surgeon keep close to the arch of the pubis, without actually encountering the bone with his trocar, he cannot fail to strike the bladder fair.

For this operation the patient is to be laid as for lithotomy, on the side of his bed, on his back, the knees raised and separated by assistants, and the heels placed firm upon the bed, near the buttocks, or held by the assistants on each side; a skilful assistant is to compress the abdomen with both hands, so as to depress the bladder and keep it steady.

The surgeon is to imagine a line drawn in the direction of the transverse muscle; i. e. from the anus to the tuber ischii, and the centre of the triangle which that line forms with the arch of the pubis, or a little higher than the centre, is the point at which the trocar is to enter.

The catheter is to be introduced as far as it will pass, to prevent any harm to the urethra, and to direct the trocar; the fore-finger of the left hand is to be passed deep into the rectum, to feel the bladder or the swelled gland, and to enable the surgeon both to judge of the relation of parts, and to keep them in some degree steady; the trocar, which must be long, slender and a little curved, must have a big, round handle, and the surgeon taking the handle in the palm of his right hand, and laying the fore-finger along the canula to steady it, is to enter it, at first, directly into the part inclining a very little upwards, and to carry it on slowly, steadily, and without fear, until he feel it in the open cavity of the bladder, when, by withdrawing the trocar, the urine will flow out.

“The operation of paracentesis, though it be no more (says

Dionis) than a simple puncture, requires on the part of the surgeon, a perfect knowledge of anatomy, and of the relation of parts, both to conduct his instrument directly into the bladder, and to avoid encountering any important parts ; it is indeed alarming to a surgeon little versed in anatomy, though extremely easy to those who are." To this opinion we very willingly subscribe ; if the operation be at all perplexing, it must be to those only who are ignorant of anatomy, but I have gone a step farther in protesting that it can be difficult to no one who has discretion and courage ; and that it is as easy to strike the broad anterior surface of the bladder under the arch of the pubis, as to plunge into it from above.

#### FOURTH METHOD.

When the catheter is obstructed and can by no means be forced into the bladder, what is the difficulty ? some stricture, amounting almost to obliteration of the membranous part of the urethra, or more frequently an induration of the prostate. Where is the catheter arrested ? always near the point of the prostate gland ; it stops just where the point of the catheter passes the finger laid on the perinæum, and at that place where it is felt upon introducing the same finger into the rectum. If the catheter could be thrust through this obstruction and driven into the bladder, even at the expence of some violence, and much blood, would such rudeness be fatal ? by no means, such an operation would, on the contrary, give present relief.

If either by thus pushing on the catheter with some laceration of parts within, or if, by a small incision in the perinæum, the course of the urethra could be recovered, and a probe passed along it, or the common grooved directory, or any such instrument introduced, would such injuries be at all equal to those I have enumerated ? or would the danger of inflammation, when the neck and natural opening of the bladder were thus forced, be at all comparable with these dangers, which must accompany a wound of its body, whether from above the pubis, or from behind the prostate gland ? surely not. If surgeons would but condescend to make themselves correctly masters of this piece of anatomy ; if, having passed the male catheter as far as it could go, they would then, with a small incision, seek out the obstructed part of the urethra, they would be able either to help on the catheter with the probe, or to dilate the urethra, or to force the prostate gland, by passing a female catheter straight on from the point where the male catheter stops ; and a wound so bloodless, so far from the pelvis or abdomen, so nearly resembling the thrusting on of the catheter,



affecting merely the neck of the bladder, might be resorted to early, and many precious lives be saved.

## FIFTH METHOD.

If there be a method which may be put in competition with this, it is that of puncturing from the rectum. I am not indeed ignorant that this way of reaching the bladder lies under the formal protest of some writers, but they are of those who have written about surgery by conjecture, whose authority stands on no other grounds than reasoning ; and what reasoning can discover any thing superior in the common and rude operation of making incisions in the perinæum, when compared with this of puncturing from the bladder ? The surgeon must have little confidence in either his reasoning or experience, who says, “ we shall therefore dismiss this method (*viz.* the puncture “ from the rectum) without farther consideration.” Yet this is wisely said, for the question will bear no reasoning ; first an operation is described, in which, after incisions long and deep in the perinæum, a trocar is plunged into the bladder, sometimes through the diseased prostate, but more frequently behind that gland, if the design of the operation be truly fulfilled ; and next, the puncture from the rectum is protested against because the trocar may wound, forsooth, the *vesiculæ seminales*, when in fact the operation by incisions in the perinæum brings the trocar to that very point, where, if struck from the rectum it must enter.

The project of puncturing the bladder from the rectum, originated, like many valuable inventions, in accident. The surgeon introducing the finger into the rectum, felt the bladder distinctly ; and to use the expression of one gentleman, (who however unfortunately neglected the hint,) “ the bladder was felt so distinctly, and the fluctuation of urine was so obvious, that the surgeon was conscious he could have struck a lancet into it as easily as into a vein.” Others more confident did actually strike the trocar into the bladder, through the walls of the rectum, and draw off the urine very easily, and had the happiness to find that the canula could be retained, and that when, by accident it slipped out, the perforation still continued open, so as to permit the urine to pass, and yet the contraction of the levator-ani muscle shut the opening like a sphincter, so that the urine never flowed except when the bladder was sufficiently full to excite desire, and when the natural course of the urine was restored, the opening betwixt the bladder and rectum spontaneously healed. With such advantages, with no important parts endangered in the operation, this method is unfortu-

nately limited ! it was once practised very happily in a child, whose urine was obstructed by a stone sticking near the glans penis ; it has been practised also with the best effects in young men, who have had the urethra burst, by falls upon the perinæum ; but it is to be preferred chiefly in cases where the obstruction is temporary, and when we have reason to hope that the natural course of the urine will be soon restored ; but in the most frequent and most distressing of all cases, the disease of the prostate, this method I fear cannot be of use.\*

#### SIXTH METHOD OF FORCING THE CATHETER.

The disease of the prostate gland, which embitters so often the last stage of life, of which Dr. Fothergill, and many men eminent in literature and science, have died, is that chiefly in which the operation of paracentesis is required, a wretched resource which only prolongs life.

The surgeon is aware of his patient's condition, for he has attended him for years, and witnessed the slow but unceasing progress of this malady ; he has frequently been called to attend him in slighter obstructions of the urine, and has remarked the flattened form which the *læces* take, he has heard the feelings of the patient often described, who, along with a continual sense of pressure and fullness in the pelvis, has an unceasing desire to pass his urine ; when attempting to give him relief by the bougie, he has remarked the point of it turned backwards, and when next he has betaken himself to the catheter, and forced it through the passage, he has felt with the finger in ano, that the prostate gland filled the pelvis, and compressed the rectum ; he has witnessed the frequent returns of these paroxysms of particular difficulty, and lived in the continual fear that the obstruction would in the end be final and insurmountable. At last, from some unfortunate fullness of the bladder, from some accidental cold, from piles affecting the rectum, and producing irritation and irregular spasms in these parts, the urine is retained ; all attempts to introduce the bougie, or to insinuate the flexible, or force in the rigid catheter, are vain ; fomentations, poultices, and stimulant embrocations, produce no relief ; the bladder, contracted by long diseases, bears the distention very difficultly ; though it is but slightly distended, the anguish is intolerable, the abdomen inflames, and fever comes on, with parched tongue and rapid pulse, and thirst which cannot be indulged.

\* Mr Home relates four cases in which he performed this operation ; in one instance some inconvenience ensued from the passage of the urine through the rectum. See "*Home on Strictures*," vol. 2. c. 7. p. 329. S.

Then the surgeon is sorely tempted to do a thing which will give instant relief, but which is yet attended with unequivocal danger ! he feels that he could drive the catheter forward into the bladder, but not perhaps in the regular canal, nor without tearing through the membranous part of the urethra, and plunging through the substance of the diseased prostate. Authorities for such a practice we have none, or next to none ; unless it be an authority for this desperate plunge, that the case is desperate, and very desperate the operations to which we must next resort.

Mr. Ware, in dissecting a patient who had died of this disease, having begun his dissection by drawing off the urine, found that his catheter had, with no great force, been driven through the membranous part of the urethra, into the cellular substance of the rectum, and thence into the bladder, through the substance of the prostate gland ; and he naturally and justly infers, that had the same force been used in the living body, the violence would not have been fatal, the relief would have been perfect. The celebrated Dr. Hunter being occupied along with a surgeon, in trying to introduce the catheter, was entirely foiled, and the surgeon had gone home for a trocar to puncture the bladder ; but the doctor meanwhile trying the catheter, and using perhaps unjustifiable force, it started suddenly into the bladder : the patient was for the time relieved, but the abdomen being inflamed, he died on the third day ; and it was plain, upon dissection, that the catheter had burst into the bladder, through the substance of the gland. Dr. Hunter affects to say, that this was his design : but since the surgeon was actually gone for the trocar, we have reason to believe that the doctor did not design to perform so important an operation, so unprecedented, and so adventurous, in the absence of the surgeon, but gave a post facto reason for what happened merely by chance, by what might have been named, in a less eminent person, imprudence and rashness.

Dease, a man intrepid and fearless, and who had not (to a surgeon perhaps it is no reproach) all the delicacy and gentleness of nature, which were so justly admired in Dr. Hunter, and which, in his own peculiar department, had so conspicuous an influence on his practice, was in the habit (and I can assure the profession of this curious fact) of driving his catheter right onwards into the bladder, when at any time, gentle means and art, or cunning, failed : he allowed no degree of difficulty to frighten him from his purpose : he assured me of his success : and upon leaving me, presented me, as a token of remembrance, with two flexible catheters of uncommon size, bent at the heel, into a very acute angle, and furnished with very strong iron



wires, assuring me that he had often used them thus successfully, and soliciting me to make that bold use of them, which, thank God, I have never had occasion to think of. I would not willingly acquaint a tyro in surgery, with an expedient so full of danger; if the catheter, ever is to be forced thus, let it be done by a man of judgment and skill, one who has experience to distinguish, when it is allowable to have recourse to such an expedient, and who has so much address as to be in no danger of using force, merely by being foiled for want of art. Whether it is from conversation or books, that I have some recollection of a catheter, with a concealed canula, I do not distinctly remember. But if so rash a thing has been done, I protest against it, "as a sword put into the hands of a fool." Such an instrument (a trocar-pointed catheter) would soon be in the hands of every young man, and would prove, in surgery, what the crotchet is in midwifery, a merciless resource: in cases really simple it would be used, by young surgeons, with little discretion. The catheter is, I am persuaded, sufficient, if skillfully used, to make its way through almost any obstacle.

The operation of paracentesis vesicæ is one which the surgeon must perfectly understand, since the occasions are sudden and imperious; and while he is balancing amidst imaginary difficulties, or comparing a variety of expedients, (none of them without danger) his patient may be lost. It is an operation which it is most important to scheme and study, for various expedients may suit the circumstances of particular cases. Of all the operations which I have reviewed, any one must seem preferable to that in common use; and that perhaps is best which the surgeon can best perform.



## DISCOURSE XVII.

PRELIMINARY DISCOURSE ON THE ANATOMY  
OF THE CRANIUM, AND THE RULES OF  
PRACTICE DEDUCED FROM IT.

## SECTION I.

*Introductory Observations.*

**I**N injuries of the head, the chief object of your studies must be to learn the signs and causes of danger, and to judge wisely of the motives which should induce you to operate. For in the operation of trepaning, as far as the operator is concerned, there is nothing formidable, nor any thing which the most unskilful cannot easily, I fear too easily, perform.

But such is the uncertainty of these signs ; so often does our patient fall suddenly into slight paralysis, and faints and expires while we apprehend no harm ; so often does he revive from that stupor which seems to arise from extravasated blood oppressing the brain ; that the diligent investigation of the true signs of danger, of the causes of oppression, or ulceration of the brain, (a severe and complicated study) should be the chief occupation of the surgeon. But it has not been so ; operations have been more studied than the means of avoiding them.

Those who, on the revival of learning, assumed the weary task of explaining the first writers on medicine, were not men of practical skill, but philologists, commentators, men of mere learning ; and they commented best, most learnedly, and indeed most suitably to the text, who shewed themselves most ingenious in multiplying the distinctions of fractures ; as those were thought to operate best, who found means of applying the greatest number of trepans to one skull. But of all the lessons of the old school, the one most dangerous to the young surgeon is that which teaches how to distinguish fissures from sutures ; for the rules for distinguishing fissures clearly imply,

that wherever such fissure is proved to exist, it is allowable it is necessary to trepan the patient; and thence a fracture of the skull, and the necessity of trepaning the injured part, are so inseparably connected in the surgeon's mind, as to form the most essential rule in his practice.

In surgical systems, I do not know any two arrangements more irrational, or more exceptionable, than these two: First, That in treating of amputation, the subject is always opened with a dissertation on gangrene, as if the fear of gangrene, or its actual existence, were the sole motive, or at least the most frequent, for amputating a limb. Secondly, That in explaining the operation of trepan, the subject is invariably introduced with remarks on the sutures, the cancelli, the variable thickness of the cranial bones, and the many scholastic distinctions of capillary fissure, fractures, depressions, and depressed fractures of the skull, as if such fracture or fissure were the sole motive, or the most prevailing one, for applying the trepan. This is not the meaning of our operation; we often perforate with the trepan, to give vent to the purulent matter, often to give vent to extravasated blood, sometimes on account of a depression of the bone, sometimes to cut away sharp points which may hurt the brain or membranes, or to take away balls or foreign bodies nitched into the substance of the bone, but never on account of mere fracture of the skull.\*

*First*, You are desired to remark the constitution of these flat bones, "that they are composed of two tables or plates of solid bone, with intermediate cancelli, (or cellular substance, such as is natural to bone, full of blood-vessels) which bleed when with your trepan you have sawed through the outer table, occasioning at the same time a change of sound." This, though occasionally modified, you are taught to regard as a rule of practice; and, to every elementary book, you find it to be a most important subject of debate, whether, in perforating the skull, you should use the trephine, which saws rapidly, or the trepan, which, from making only half circles, cuts more slowly; or, whether you should first use the trephine, till you have cut down to the cancelli, and finish the more delicate part, the sawing off the inner table with the trepan. Never, perhaps, was any remark more unfortunate than this, which refers the surgeon to the bleeding and the change of sound, as signs of having cut through the outer table, and teaches him to be proud of sawing rapidly. Of all operations, this is the one where precipitancy and hurry have the fewest apologies, since the patient usually lies insensible, since the sawing of a bone occasions no

\* All the directions therefore, which the older physicians, from Hippocrates downwards, have given for the discovery of fractures and fissures, are now useless. S.

pain; since the trepan is an operation where haste may occasion the most dismal consequences, from wounding the dura mater, which, when left uninjured, supports the brain, (after the removing of a piece of the cranium) like a second skull.

*Secondly*, But this first suggestion is inconsistent with a rule much more worthy of notice; viz. "that in all circumstances the surgeon should saw cautiously, on account of the incalculable irregularities in the thickness in the cranium, which is universally thin in boys and very aged people, and is, during all the middle stages of life, extremely irregular, generally thick, but at certain points extremely thin, or excavated by the deep impression of tortuous veins." I approve of sawing the cranium, in all circumstances, with prudence and deliberation; but yet I discover, in all these rules, intrinsic marks of their having been invented by mere speculators in surgery, not by surgeons; for in truth we almost never operate in a mere fracture of the skull; we almost never operate where the bone is sound, and the dura mater closely attached to the bone; even in cases of extensive fracture, we rarely operate except on account of some affection of the brain.

*Thirdly*, The artery of the dura mater is described with a particular reference to the operation of trepan. "As an artery of considerable size, the chief artery of the dura mater, running along the inner surface of the parietal bone, marking the anterior corner of the bone with its trunk, and the upper part with the impression of its branches, and making a groove so deep, that the bone cannot be entirely cut through by the trepan, without the artery being divided. For these reasons it is advised, that the surgeon should avoid the whole tract of this artery, and especially that he should not trepan the lower corner of the parietal bone." That the surgeon should, except in cases of the most absolute necessity, avoid even the shadow of danger, is a precept from which I will not allow myself to dissent. But in this, as in all these notable observations on the cranium, there are strong intrinsic marks of the reflection coming from one little acquainted with practical surgery; for in all circumstances, and on all points of the skull, have I seen the trepan applied without much skill, or any thing of this foresight, but never have I seen or heard of a hemorrhagy from the artery of the dura mater\*.

\* Mr. A. Cooper mentions in his Lectures, an instance in which this artery was divided by the trepan, the hemorrhagy was at first considerable, but easily suppressed by a piece of lint pressed upon it for a short time. That this artery must be inevitably wounded in removing the anterior and inferior corner of the parietal bone, in a great majority of cases, is most certain, of which any person will be satisfied upon examination. S.



*Fourthly*, You are warned of the danger of wounding another important vessel,—the Longitudinal Sinus. You are told, “that the longitudinal sinus is the greatest vein of the brain, named longitudinal from its running along the whole length of the scull, and changing its name at the occiput, where it forks into the branches which terminate in the great jugular veins, and are called the lateral sinuses;” and it was set down as a very absolute rule, “that the scull should never be trepanned in the line of the sagittal suture, under which this sinus lies.”—You are told that such a wound is fatal.

This is none of the surgeon’s rules, who, if he had at all mentioned the longitudinal sinus, would probably have observed how sluggishly the blood moves along in the great sinus; that it is more properly a reservoir than a vein; that there surely could be little danger in wounding it; that often when we find it necessary to operate in the direct course of this canal, we feel it turgid under the finger, that in such a case the temptation is too strong, not to be yielded to, of striking the bleeding lancet into it, with the hopes of relieving the patient from the lethargy in which he lies. Warner and Pott have both seen the longitudinal sinus punctured by fragments of bone, and the blood flowing from it profusely, which was yet more easily stopped than that flowing from a vein, merely by applying to it a piece of dry lint. Pott and Warner have both, without scruple, opened the sinus with a lancet, and bled the patient from it\*.

Calisen, the celebrated Danish surgeon, having trepanned a sailor who was knocked down by a block falling from above, felt the sinus lying turgid under the finger, and seeing no prospect of the oppression in which his patient lay being relieved, bled him from the sinus with as little concern as he would have done from the jugular.

*Fifthly*, I am now to speak of a rule more purely hypothetical than any I have yet commented upon. The dura mater was supposed by the ancients to pass through the scull by the indentations of the sutures, not merely to connect itself with the pericranium, but to form that membrane, and from thence was supposed to be derived all the membranes of the body.

The name of Crassa Meninx, or Dura Mater, was derived from this imaginary office of forming all the other membranes, and the surgeons were advised not to scrape the sutures with the rugine, nor trepan near them, lest he should injure this most important connection.

The surgeon is called upon to remark the peculiar firmness with which the dura mater adheres to the sutures, and coun-

\* Vide Warner’s Cases, p. 10. Pott’s Surgical Works, vol. 1. p. 196.



selling not to apply the trepan exactly upon a suture, when the dura mater adheres so, but on each side of the suture, so as to be thus sure of finding the extravasation. But I no more find this adhesion capable of limiting extravasation, than the sutures capable of stopping fractures. I find the extravasation always extending beyond the place of the sutures, and covering very generally one entire hemisphere of the brain. I never saw any occasion for applying the trepan, first on the one side, then on the other side of the suture, though much has been written on this subject. I find in no book a proof of extravasation having been limited and interrupted by intervention of a suture, nor one case unequivocally stated, where the surgeon, having applied his trepan on one side of a suture, was obliged to repeat his operation on the other side.

*Sixthly,* In describing the frontal bone, its internal spine or ridge running longitudinally along its inner surface, is pointed out as particularly interesting to the surgeon, as being an absolute bar to the perforating of that part of the bone. The observation seems important, the difficulty seems demonstrable; but this, though it be a difficulty which must naturally present itself to the imagination of the speculative anatomist, is one which can have but a slight influence over the resolution of the practical surgeon. He recollects, that in most of his operations, even upon the most level and equable parts of the cranium, he seldom dares to cut both tables of the cranium entirely through, but leaves part of the circle uncut, and begins with his elevator to poise out the sawed piece of bone, before it is entirely insulated; the part that is uncut usually breaks and splinters with an audible noise, and he smooths the ragged edges of the trepan circle, with the instrument named Lenticular. Though a well-instructed surgeon will not fail to recollect this internal ridge of the os frontis, he will nevertheless perforate here when the operation is required at this point, with this sole precaution, that he will saw more circumspectly, will cut through all that he safely can of the circle, burst up the rest, and smooth the ragged edges of the hole. It is only in one single point, at the very root of the nose, at a point considerably lower than we ever need to perforate, it is only in the very middle betwixt the brows, and in a space no bigger than one crown of the trepan will cover, that this spine can at all prove an interruption. I know no mischance, by which the most ignorant person could be induced to apply the trepan so low, and believe that there is more danger of a thoughtless operator doing harm when trepaning upon the ridges of the occipital bone; but in neither the one place or the other is the trepan required; of an hundred cases in which this operation is required, the instrument

is placed in ninety-nine cases upon the upper parts of the skull, upon the parietal or frontal bones.

The rules which I deprecate, often incline the young surgeon to deviate from the plain way of common sense, and, by avoiding imaginary, he runs into real dangers. To understand the case I am now going to relate, you must assent to one principle, which I shall afterwards prove in the most unequivocal terms; and it is this: "That mere depression of the skull, which was once believed to be the most perilous of all accidents, has really but a very slight effect in compressing the brain."\* The line of a depressed bone deviates but in a very slight degree from the natural convexity of the skull; the depression, as such, produces no compression, for the patient walks about unaffected, or but very slightly; and if he falls into a dangerous state, it is indicated by tremblings of the hands and knees, a sort of imbecility, slight shiverings and nausea, which are signs, not of compression, but ulceration of the brain or its membranes. The bone itself is sometimes deadened by the blow, or its spiculæ and fractured edges stick in the membranes, and occasion suppuration; while the integuments continue entire over a fractured bone, the interstices often are filled with extravasated blood and gluten, and soon become vascular, so that the bone reunites, as in the fracture of a limb, and the brain and its membranes remain sound; but if the integuments be much injured, and the depressed and fractured bone exposed, ulceration is apt to ensue.

"W——— L———, a chimney sweep, fell from the third storey of a house, upon a street paved with very coarse round stones; though he had sustained a very dreadful fracture of the skull, he was very little affected, and not brought into our hospital till eight days after the fall. The clerk or surgeon, far from expressing an alarm either at the nature of the accident, or the peculiarity of the symptoms, described the case thus in the books: "He has, on the lower part of the frontal bone, a fracture in the form of the letter V, about an inch in length, and with a spot of the cranium, which you could cover with the point of your finger, bare, but without any mark of depression." By marks of depression was meant, perhaps, "signs of oppressed brain:" for, though he had no such signs, the depression was great, and was easily distinguished by the finger or the probe. When I first saw this man, he was sitting up in bed, submitting to the operations of the dresser, talking rationally, and apparently little injured; and I was told that I might,

\* That mere depression of the skull, and that to no great degree, will frequently produce all the symptoms of oppressed brain, is clearly proved by the relief which ensues immediately the depressed bone is elevated or removed. S.

if I pleased, feel a fracture pretty distinctly, but without depression, and that the patient was in no danger.

I formed a different conclusion from every circumstance of this case. The height from which the patient fell was very great; he had fallen perpendicularly upon the forehead, else it could not have been fractured, and he had not broken, nor even sprained, a wrist or ankle, so that there was no intermediate shock to break his fall. He was indeed sitting on the side of his bed, but extremely meagre, sickly, pale, languid, and dejected; his eye was sunk, his cheek hollow, and his face somewhat distorted with spasmodic twitches. Upon opening the lips of this triangular wound, which was now suppurating, and puffy, I found that the fracture seated exactly in the middle of the forehead, was very wide, and that the bone at the lower part of the fracture, and immediately over the eye-brow, was much depressed; and, worse than all, I found the bone so completely discoloured, that though the depression did not affect the brain, the carries, I was sure, would, in process of time, affect its membranes, and cause suppuration. That the fatal symptoms were begun, I was convinced, by a more deliberate examination of his nurse and attending friends; for, though he sat on his bed, bore the perpendicular posture, and suffered the operations of the dresser; though he answered pertinently to all our questions; his articulation was slow, his motions languid and listless, his eye oppressed, his breathing anxious, and accompanied with sighing. There was a sort of sardonic grin, or distortion of face, and a silliness or fatuity of look. His pulse was quick and irritable, his tongue parched; he had a hectic flush upon his cheek. Though he made no complaint, he was sickly, his hands trembled, he vomited frequently during the night. He was always slightly delirious during the night, before he was thoroughly roused; and during the day, he walked round his bed, fumbled about the cloaths, seemed to wish to do something, yet had no purpose. In short, he was in a state of indescribable disorder, never soundly asleep, nor entirely awake; and, though his sickly condition conveyed no intimation of approaching danger to his ignorant friends, it could not but be observed by his medical attendants; for these are the signs, slight as they appear, which announce suppuration within the cranium, and approaching palsy.

A consultation having advised that the patient should be trepanned, the operation was performed with such circumstances of misconduct, as I think very impressive and instructive.



There was a large transverse fracture across the lower part of the frontal bone, with one limb extending into the orbit. The lower part of the bone above the frontal sinus was depressed the full thickness of the bone, and the depressed portion of the bone was plainly carious, black, and dead. Unhappily the rules of surgery, which the operator but too well remembered, and applied too accurately, were in every thing opposite to the dictates of good sense. The rule says, "apply your trepan upon the sound bone, which can best bear it, that you may be able to press your levator under the depressed bone through the trepan-hole." But common sense directs no man to cut away a sound and living portion of the cranium, to save by elevation a part which is depressed, and perhaps dead. The rules of surgery say, "You shall not trepan on or near the frontal sinus;" while common sense requires the surgeon to perforate wherever any cause of danger exists. The rules of surgery would impress us with the belief, that "of all the accidents of fracture, depression of the skull is the most fatal cause of compressed brain, and the one which most immediately requires the operation of trepan;" while this very case, combined with a thousand collateral proofs, shows how slightly the greatest depression of the cranium affects the functions of the brain, for fifteen days had elapsed before it was distinctly known that the bone was depressed, or the man in danger.

Though the depression of the skull was, in this case, the circumstance which should chiefly have attracted the attention of a tyro, thinking only about the anatomy of the skull, and imagining nothing more correct or absolute than these mechanical rules; the carious or dead part of the bone affecting the dura mater as a foreign body, would alone have appeared important to one who reasoned on the affections of the brain, and knew them by their signs. The one would have thought only of elevating the depressed portion of bone, the other of cutting away whatever was dead. The one would have applied the trepan upon the sound bone, the other would have applied it upon the injured part.

Resolved to perforate as far as possible from this formidable sinus, the frontal sinus, the operator, instead of elongating the triangular wound of the integuments downwards, prolonged it by incisions upwards, and applied the crown of his trepan upon the sound and undepressed bone above the fracture. The os frontis was extremely thick, like that of a rachitic person; in avoiding the frontal sinus, he encountered the frontal spine, and was, though it may seem incredible, fully an hour in accomplishing the perforation, the patient all the while crying out,



struggling, and taunting him with expressions which I thought he very well deserved. But, after having sacrificed this sound part of the skull in favour of a part carious and irrecoverable, he found the depressed portion not only well able to bear the working of the trepan, but so exceedingly firm, that no force of levers could enable him to raise it. The operator, conscious that he had by this perforation done nothing effectual for the relief of a patient who had endured so much, was now willing, after an intermediate consultation, to attempt what should have been done at first. The incision of the integuments was carried downwards through the eye-brow, to the root of the nose; the whole extent of the depression, and of the deadened portion of the bone, was now displayed. The fracture was seen running down into the orbit; the operator would have now applied his trepan upon the depressed portion, which should have been first cut away; but, after operations and consultations lasting an hour and a half, the patient, exhausted by his cries, resistance, and loss of blood, the manifest inhumanity, too, of continuing such unavailing cruelties, induced the surgeon to commit his patient to bed, where his rest was long and sound. What he suffered afterwards, I had not the courage to inquire, but he died.

## SECTION II.

*Of trepanning the Frontal Sinus.*

The alarm about wounds of the frontal sinus has been universal; the injunctions not to approach it with the trepan have been transcribed from book to book, in the same unvarying language.

But never having been accustomed to indulge these irrational fears, I trepanned this sinus\* in a case of general convulsion, singular in all its circumstances, and not un instructive, but especially in this respect, that it was plainly connected with a disease of the frontal sinus.

“A very tall, well-made, and handsome lad, about twenty-four years of age, a house-carpenter in Appleby, while assisting his fellow-workmen in laying a heavy beam upon the frame of a saw-pit, slipped a foot, and falling forwards, had his head

\* Although the frontal sinus may undoubtedly be trepanned, it is certainly rarely, if ever, necessary to do it, so as to expose the brain, which is the reason why the surgeon is directed to avoid it. As to merely opening the sinus itself, there can be neither difficulty nor danger in the operation. S.

immovably wedged betwixt the beam which they were lifting, and that which had just been laid upon the frame; and so heavy was this log, that his companions were obliged to take their hand-spikes and poise it up. He cried out during the time his head was wedged between the logs, and when released was able to rise; though giddy, he was not insensible; nor did the blood burst from his nose and ears, as might have been expected after such an injury.

“ Though his head suffered this pressure on the sides, being compressed from temple to temple, there is every reason to believe that the forehead had suffered, and the frontal sinus been injured; for he walked home under the agony of an acute head-ach, which soon, however, subsided into a heavy, dull, and continued pain, aggravated at times, but never entirely absent. His head was confused; he gradually lost his hearing, and by the third week from the time of the injury, was entirely deaf: he returned to work, but his headach, giddiness, and deafness, were unremitting, and he had occasion to remark, that “ he never, from the moment of that bruise, had a good head for standing or working in difficult places.”

“ The sudden manner in which he regained his hearing, and the profuse flow of matter from the ears and nostrils, which opened the passages, are very remarkable. It happened about a fortnight after losing his hearing, that while he was working in the fields, upon blowing his nose, there rushed out from one ear a great quantity of matter, with a painful noise. He fell down by the wall in a sort of fit, lay for some time insensible, and when his senses returned, he was as much surprised at hearing the barking of dogs, and the voices of the people in the neighbouring village, as if he had been born deaf. He now found that matter was flowing from the nostrils, as well as from the ear, with a smell so offensive, that at first he imagined that his hat in his fall must have lain in some foul place. He smelt his hat first, and looked to it, but found it not soiled, nor foul, and upon blowing his nose, there run out into his handkerchief a profusion of foul and very fœtid matter, mixed with blood.

“ When he had fully recovered his senses, he found that the discharge of blood and matter from the nose was accompanied with agonizing pains in his head; he retired to the shelter of an unfinished house, where his companions had been working, and threw himself down on a bed-frame, and lay there alone till evening, with his head hanging over the bed-frame, a black, fœtid, and bloody matter distilling profusely from his right nostril, while an acute and confused pain ran through his forehead. He got up, after some hours, and walked to his father's house, about a mile distant, in great pain and confusion of head.

“From this time the pain in his forehead was unremitting and severe, and when heated at work, it was particularly violent.\* This pain, at the root of the forehead, was aggravated at times to violent paroxysms; it affected the eye, puffed up the eye-lid, swelled the whole side of the face and forehead. The discharge from the nose continued very profuse, and this local disease, accompanied with general headachs, afflicted him for five years, and a permanent bony swelling, marked by a very conspicuous protuberance of the right eye-brow, at the place of the frontal sinus, was formed.

“But his complaint underwent a sad revolution in consequence of a second fall, which happened thus: After mowing hay in weather which was oppressively hot, he retired with the other labourers at mid-day, to rest in the hay-loft; being overcome with labour, and having fallen into a perturbed sleep, he by successive restless motions got so near the edge of the loft, that he at last slipt over. One of his fellow-labourers chanced at that moment to observe him sliding, and ran to catch him by the feet, but too late, for he fell from the loft headlong, upon a rugged pavement of big round stones, and alighted exactly upon that part of the forehead which had been long the seat of disease; for I find the scar of the wound which he then received, just over the bulging of the right frontal sinus. He lay insensible during a quarter of an hour, and when he revived he felt sick, faint, and languid; and his companions being gathered about him, he waved his hand as for room, and a freer breathing-space. They carried him into the open air, where he instantly fell into an epileptic fit, which epilepsy has continued ever since.

“The epileptic paroxysms returned frequently, at least every night and morning, from the time of this fall. He was weakly, almost parylitic, walked only with the help of stilts, and trailed his limbs along. In about five weeks he had so far recovered, as to think himself strong enough for work, and the paroxysms, which had at first recurred three or four times a-day, became less frequent, ceased at last, and were absent entirely for a week. Thus encouraged, he returned to his daily labours, and by the violence of his labours the fits came on again. He had been now six months labouring under this disease, is reduced, weakened, and dispirited; is distorted with these fits of spasm or convulsion twice a-day at least, and tormented from hour to hour with severe threatenings. Fits so peculiar, and proceeding from so unusual a cause, I think it right to describe with particular care.

\* He recovered, about a fortnight after this, the hearing of his other ear, by a like discharge of matter, which also happened suddenly upon blowing his nose.



“ The convulsion is distinctly connected with the disease of the forehead. The approach of each paroxysm is announced by pain of the forehead, with a sense of fulness ; first his jaw begins to shake with a trembling, and convulsive motion, and the tongue, too, trembles, and is retracted into the mouth. This is the warning or first alarm of the approaching paroxysm, which sometimes, as he imagines, he prevents by clenching the jaws, and holding them firmly. Being once attacked when reading, he, in hopes of stopping the convulsion, thrust the book into his mouth, the convulsion increased, and was as usual propagated along the neck, arm, and side ; the book was so fixed by the convulsion of the jaw, that he had no power to withdraw it, and the suffering was so dreadful, that he remembers having howled with agony.

“ But the convulsion only begins in the jaws, then trembling and convulsive motions run downwards along the neck : his head is turned to the right side, while his neck is tortured with the spasm ; the convulsion descends from the neck down the arm, and to the hand, which is clenched and contracted, till the whole of the right side is affected with it.

“ Besides frequent threatenings, and incessant fear, he has three or four regular paroxysms during the day. He is warned of its approach, like those who have the *aura epileptica*, by slight distortions of the parts, and a confused sensation in the forehead ; he immediately clings to a bed-post, a chest of drawers, a door, or some firm body, continues sensible, and feels all the horror of its slow approach, and all the pains of the convulsion ; and the perpetual fear of this attack has given his countenance an anxious, subdued, and melancholy cast. First in orderly succession, comes the pain and fulness of the forehead, then the tremblings of the jaw and tongue, then the sore contractions of the neck, which draw his head over the right shoulder, and then successive cramps and convulsions of all the right side of the body, till it is bent down ; and in this state of agony he continues four or five minutes, when the muscles of the side, of the arm and of the neck gradually and successively tremble, and fall into a quiescent state, and the convulsions of the neck and arm having remitted, the spasm of the jaw, and trembling and retraction of the tongue also cease, and then he returns slowly to his seat. He is always in great confusion, but never insensible, during the fits, unless it be during the night ; for it would appear, that during sleep he is seized with fits more nearly approaching to the nature of true epilepsy. He passes his *fæces* and urine involuntarily during the night. His disease has, if not the express form, at least the effects of epilepsy ; for his faculties begin to fail, his memory is injured, certain words he is unable to pronounce,



or pronounces them with a painful and convulsive hesitation. Although he does not actually fall down, his confusion during a paroxysm amounts almost to insensibility, and each paroxysm is followed by drowsiness and a degree of oppression, so that very commonly he falls asleep, his right eye is turned obliquely inwards, the swelling of the frontal sinus over it is very prominent, and gives an obliquity to the whole countenance; the matter which runs from the right nostril only, is in great profusion, it is partly glairy, partly purulent, amounts to two or three ounces in the day, and sometimes entirely fills a bleeding palate\*. His speech, especially after a paroxysm, is slow, difficult, hesitating, and interrupted. When pain of the forehead comes, and is not followed by convulsions, he has a general feeling of weakness, as if all his joints were loosened; he trembles, and his knees shake under him, and he has a trembling and paralytic feeling in the arm."

This is the whole state and condition of this young man, who, from uncommon health, and bodily strength, is reduced to great weakness and despondency; and since the first signs of the paroxysm are distinctly referable to the frontal sinus, and since the convulsion affects the same side of the body with the injured part of the head, all suspicions of its arising from any disorder of the brain are removed. I have resolved, (encouraged and supported by the unanimous voice of the consulting surgeons), to trepan the sinus, hoping, by curing this ulcer, to remove a possible cause of disorder: The dismal situation, and earnest intreaties of the patient, are arguments too powerful to be resisted; and the operation, though unusual, is no rash enterprise, but, on the contrary, entirely void of danger.

I laid open the diseased and much enlarged sinus with an incision of little more than an inch long, and perforated the bone, which was of such thickness, that the assistants believed that I had mistaken the case, and pierced not the outer plate of the sinus, but the whole thickness of the skull; and they plainly said, that the membrane now exposed was not the lining of the sinus, but the dura mater. But it was merely the lining of the sinus; the injections passed from this small trepan-hole, into the throat and nostrils, and the patient could at pleasure draw it back again through the trepan-hole. By a little skill and practice, and by inclining the head of the patient properly, the dresser soon learnt to direct his injection, so that the whole of it flowed out by the right nostril. The lad continued under my care for three months, and I injected the sore first with barley-water, then with solutions of vinegar and honey, then with tinctures of bark and myrrh, and finally with tinctures of corrosive sublimate

\* Containing from four to five ounces.

and crude sal ammoniac; but (as I must confess) without the slightest alteration on the matter, (which ran profusely from the nostril), or the slightest improvement of his health: Despairing of doing good, and wishing that he should leave the precincts of an hospital not always healthy, and enjoy his native air and better food, I sent him home, having first withdrawn the tent, and healed the fistula, which closed solidly in two days, and had always been inclined to close. So untrue are all these idle tales about the danger of wounds, and the rashness of trepanning this part.

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## DISCOURSE XVIII.

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### OF THE PATHOLOGY OF THE INTEGUMENTS, SCULL, AND DURA MATER.

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#### SECTION I.

#### *On the Vitality and Connections of the Skull.*

AS you are now aware of the important truth, that the rules of our art are not to be deduced from the external forms of the skull, I shall now begin to unfold the true theory of injuries of the brain, by explaining, not the outward form of the cranium and the anatomy of its several bones, but the internal organization, the living powers, the susceptibility of injury, and the sympathy of the pericranium, the skull, and dura mater with each other :—these are the integuments of the brain, and from the slightest injury of the most remote of these, there often ensues, slowly, imperceptibly, and at a distant and unsuspected period, suppuration of the brain itself. Life is endangered more frequently by a laceration of the integuments, or by a mere contusion of the skull, or by an imperceptible separation of the dura mater, than by the widest fractures. Now, the proofs of this consist in facts, which even in their simple detail, though not connected by theory, nor recommended by any ingenious explanation, would be of themselves useful; but the mutual dependence of the scalp, the skull, and the dura mater,

is so clearly made out by innumerable practical examples : the progress of disease, from a slight puffy tumour of the scalp, to a fatal suppuration of the dura mater, is so plainly traced ; the slow but undeviating progress of fatal signs, from the first nausea, and slight tremblings of the hands and tongue, to the fatal convulsions, is so easily traced, and forms so interesting a subject for judicious prognostics, and sensible and manly practice, that I know not in the circle of our profession a piece of pathology more intelligible, nor a subject of inquiry more easily prosecuted, to sure and interesting conclusions. And we have this encouragement to consider the pathology in place of the anatomy of the skull, as the rule of our prognostics, that while anatomy, and the enumeration and classification of fractures, has led to an undue propensity to operation, the study of the living powers, and mutual dependence of these parts, leads to a reserved, modest, and rational practice,—to a just confidence in the powers of nature,—to a careful and solicitous attention to all the insidious symptoms of suppurating brain.

The integuments or scalp, i. e. the successive layers of the skin, occipito-frontalis muscle, cellular substance, and pericranium, are closely connected with each other, and with the skull, by one continued tissue of vessels. When these integuments are separated from the skull, even in the dissection of the dead body, the skull sweats out drops of blood from every point of its surface. The outer table of the skull is so plainly alive, that the surgeon can perfectly judge of its death : when alive, it is moist, clear, and bleeds upon being perforated ; it is by its dryness and faded colour, and its bloodless appearance, (and when trepanned,) by the dryness of the dust turned out in sawing, that the surgeon is able to pronounce it carious and dead. The skull is nourished, yet not altogether dependent for its circulation on its periosteum and scalp : a piece of scalp may not only be raised by a clean cut of the sabre, and laid down again so as to adhere to the bone, as to any soft part, but being cut off, it is replaced, in part at least, by granulations from the skull. The integuments not cut, but lacerated, detached from the skull, flapped down over the face and ears, soiled with earth and mud, will, upon being cleaned, and laid in their place, adhere to the skull.

The skull re-unites thus easily with the integuments, from having every essential provision for life and circulation within itself. It is by means of the same provision that when large and broad pieces of the skull are apparently insulated by fractures surrounding the piece of bone on all sides, with the dura mater as completely detached from the internal, as the pericranium is, by laceration, or by scraping, from the external surface of the



skull, and after being depressed by violence, are as violently raised by working with the levator, that they live and are reunited, and granulate and heal.

The circulation thus maintained by the pericranium from without, so vigorous in the structure of the bone itself, is likewise well supported from within; for, indeed, if we were to assign the nourishment of the skull to any one source, it would be to the dura mater, which is more properly the internal periosteum of the skull, than a membrane belonging to the brain; with the brain it has no vascular connection, but is separated by a halitus or secretion similar to that of other cavities, as those of the pericardium or peritonæum: with the skull it is so connected, that the skull-cap is in dissection torn up with the greatest force, and every point is covered with the ruptured mouths of delicate and bleeding vessels.

The dura mater is very firmly attached to the whole internal surface of the skull; it is hard, firm, grates like a cartilage when cut with scissors, and has a glistening surface, like the capsule of a joint: it has no appearance of delicacy or sensibility, for indeed it has none, since acids, caustics, and even the actual cautery, have been applied to it, and it has been cut and torn in experiments on living animals, without exciting pain. It enters very slowly into diseased action, and has as little appearance of vascularity as of sensibility; often it is inflamed, and even suppurated, without changing colour, and is little affected by our most subtile injections. But the injection, which does not change the colour of the dura mater, colours the bone, passes through its vessels, and runs out from innumerable minute orifices, when the dura mater is torn away: it appears from every circumstance, that the vascularity of the dura mater is destined for the nourishment of the skull, and may be truly named its Internal Periosteum: and the great arteries and veins (as they are called) of the dura mater, might be more justly described as the Nutritious Vessels of the skull. Were we first to observe this vascular connection, and then glance our eye hastily over the facts relating to it, we should be apt to pronounce the skull entirely dependent for its nourishment on the dura mater; and that its connection cannot be dissolved by disease, without corruption of the bone, and suppuration of the brain, nor detached by violence, without effusion of blood. Yet this important source of nourishment, the skull can also dispense with, and live; for, in cases of the most extensive effusions of blood under the skull, and where this membrane is divided from it by a thick and solid cake of coagulated blood, we find, that the skull bleeds in trepanning, and granulates during the cure; and although it may seem a fact difficult to ascertain, I shall



prove to your conviction, that the dura mater may by a shock be detached from the skull, and adhere again to it without harm, leaving unequivocal marks by which, in dissection, it can be known that it had been separated and re-united.

I take a pleasure in submitting to your review these facts, so opposite to the doctrines, and so inimical to the practice of the older surgeons; for they will teach you, if you dwell upon them, to have a perfect confidence in the powers of nature. With so many sources of circulation, the life of the skull is very secure: the scalp, the skull, and the dura mater, are the successive integuments of the brain, they mutually support each other, so that they cannot be individually injured; and we have reason to believe, that when the dura mater suppurates, and the brain is endangered, the whole system of this vascular connection has suffered a fatal shock, or the bone, the centre of that circulation, has been deadened by the blow. I fear that those general conclusions, which by a sort of anticipation I have laid before you, may seem more allied with speculation than practice, yet are they the true and genuine source of your prognostics.

#### SECTION II.

#### *Of Injuries of the Scalp.*

However extensive the laceration, if the skull be uninjured, the scalp not irrecoverably bruised, the patient in health, and not exposed to contagion or fever, it may (with only slight and partial interruptions) be made to adhere again to the bone. Of such recoveries, every practical surgeon has seen examples, and many interesting cases, made remarkable by the circumstances of the accident, are recorded.

The following case is related by Mr. Hill: "A drunken country-man, aged about sixty-six years, riding furiously along the street, was flung with such force against the sharp edge of a door-post, that about the length and breadth of a hand was stripped off the right side of his head, and laid down on the cheek.

"Some people, in the dark, took his wig out of the kennel, and, not knowing what had happened to his head, put it on full of mud, and squeezed his hat over it. He did not complain of his head, but complained greatly of his neck and shoulders.

"The dirt was rubbed into the *TUNICA CELLULOSA* in such a manner, that it was impossible to clean it fully out. I therefore pulled up the loose piece of the scalp, and, after washing and stuffing it with soft liniments, put four stitches into the upper part, but so loosely, as to allow the matter a free passage.

"The wound digested so well, that in five days all danger-

ous symptoms were over, and his friends carried him home without acquainting me. Having no proper person to take care of him, the stitches gave way, one after another, and it healed, leaving near two fingers-breadth of the scull bare, the teguments lying in folds on the Os PETROSUM. This circumstance might easily have been prevented by renewing the stitches. He, however, lived and enjoyed good health above twenty years."

Yet a laceration of the scalp is a state of danger and uncertainty. We never can be assured that the bone is not too much injured to admit of its re-uniting with the scalp, or that the constitution is not too weakly, or the season or the air unfavourable; we never can be assured, even when the prospect at first is most flattering, that a laceration of the scalp will not be followed by a suppuration of the brain.

"Thomas Sharpe was an itinerant dancing-master, a fidler, a performer in a military band; he died trumpeter to the Dumfriesshire militia, and had attained to all the perfection of libertinism, and dissolute behaviour, that such occupations naturally entail upon those who practice them. One morning, reeling out of a low tavern, he, after scrambling up the stairs of it, staggered forwards into the unguarded area of a house that was building, and, without any other apparent injury, had his scalp torn down over his face. The scalp was ragged in its edges, and mangled every where, with several penetrating wounds; it was separated from the whole upper part of the head, from the lambdoid suture nearly to the eye-brow, and from the vertex to the right ear; much of the scull, and especially of the os frontis of that side of the head was laid bare: nor was the opposite side without bruises, and lesser wounds, for it seemed to have been jammed in among the loose stones.

"The scalp was sponged, cleaned, and dried, and smoothly applied again to the scull; and as the edges of the laceration were irregular, and bruised, and in no fit condition to be nicely joined with stitches, they were held by plasters only, they were united in a few days with each other, and even seemed re-united on the lower surface with the surface of the scull; whatever inflammation there was, seemed a very natural consequence of the general bruises, and lesser wounds of the scalp; and we were confirmed in this good expectation, from the man's having recovered from his intoxication, and continuing in apparent health. He felt his bruises, and complained of the pain, slept well, had neither delirium, sickness, nor fever, and was bled only on account of the fulness of the pulse.

"On the fifth day, the little discharge, which issued from the irregular openings, and smaller wounds, was good; the adhesion continued apparently sound; on the sixth, the discharge

from under the scalp was more copious, and compresses soon were nicely applied to keep the scalp and the scull in contact with each other. On the eleventh day it became necessary, from fluctuation and softness in all the lower part of the detached scalp, to make an opening over the ear for the discharge of matter, which flowed so profusely, and was accompanied with such fits of rigour, that I abandoned all hopes of any firm or general re-union, and began to fear that the brain was in a state of suppuration. Upon pushing the probe through the soft and downy granulations which united the edges of the scalp with the scull, I was persuaded, that all below the mere edge was disengaged, that the whole extent of the parietal bone was rough and naked. The probe, in its progress between the scull and integuments, encountered what all my assistants conceived to be a fracture of the scull; yet still the patient retained his senses, and suffered little in his health.

“The symptoms of suppurated brain are, as I know from much experience, far from alarming when they first appear. The detached state of the scalp, the roughness of the bone, the profusion of matter which flowed through all the openings, and the slight rigours, dejected looks, and tremblings of the hand and tongue, though they are such as alarm the surgeon, can hardly vindicate him in taking any decisive step. I was persuaded that the bone was dead, and the brain in a state of suppuration: I saw no prospect of interposing with success at so late a period as the sixteenth day from the injury: I was supported by the consulting surgeons in the preliminary step of opening the scalp, and exposing the diseased bone; but they seemed to suffer a disappointment, when that rough line, which was so curiously traced with the probe, was found not to be a fracture, and, as there was no fracture, I was, fortunately for my reputation, prevented from applying the trepan; for though there was every motive for operating, the patient died next day of a disease, inevitably fatal, connected indeed with the accident, but having no relation to the state of the brain.

“Let me now, then, proceed to give you an account of the condition of this man before the operation, of the manner of his death, and of the appearance on dissecting the body. Before the operation of cutting up the scalp, there were no decisive signs, nor fatal prognostic; for of all the fatal affections of the brain, this of suppuration of the dura mater is the most insidious in its progress; and our patient, before we apprehend him to be in danger, is in general beyond the reach of help. This man, though he had the cranium naked, the scalp in full suppuration, and a profusion of thin matter pouring out from various openings, had no other symptoms than slight rigours.



and no more violent rigours, indeed, than often accompany the slight fever of a lacerated scalp. It was towards the sixteenth day, perhaps about the fourteenth, that these rigours were followed with a sweating stage, that they became sensibly more frequent and violent, and that they were accompanied during the day with unusual languor, and in the night with a slight delirium, which disappeared only when he was thoroughly roused from sleep. Yet, at this most critical period, I could not make him say that he had any corded feeling over the brow, any head-ach, any thing which might indicate to his own apprehension a disorder within. I could not perceive the slightest wavering in his intellect; I could not find, in the irritable state of his pulse, the foulness of his tongue, the dullness of his eye, in his perturbed sleep, and alarming dreams, any thing more than the feverish disorder naturally accompanying so extensive a laceration of the scalp; and yet at that moment was the suppuration of the dura mater fairly established, and the brain itself deeply tainted.

“An increased drowsiness, with rigours more violent than usual, a degree of headach, and a sensibility to light, induced us, upon the sixteenth day, to cut up the slight adhesion of this great flap of suppurated scalp, which immediately fell over the ear, and left the whole parietal bone exposed, in a condition perfectly decisive, in my opinion, of the state of the brain, and indeed of the patient's fate. There was a portion of the parietal bone broad as the palm of my hand, of a square form, apparently insulated from the rest, black, carious, and elevated above the level of the surrounding bone, and circumscribed by a line as decisive as if it were a fracture. This part, which was the centre of the parietal bone, was rough, dry, and prominent, of a dark yellow colour, engrained with black spots like a toad's back. The pores of the bone, or, in other terms, the minute and almost invisible holes by which the blood-vessels enter it, seemed wide, and not red as when blood is circulating, but black. In the margin immediately surrounding this, where the bone was still alive, and in a state of ulceration, the bone was wasted, so that the carious part was left prominent, with a line so fairly circumscribed, that, when felt with the probe, it might be mistaken for fracture; this is indeed, uniformly the condition of a dead and exfoliating piece of the skull. Beyond this ulcerating circle, where the integuments and muscles adhered, they adhered with particular firmness, being crammed with extravasated blood, and hardened by inflammation. Though the certainty of the brain being in a state of suppuration, inclined me to perforate the cranium, the certainty now of there being no fracture inclined my assistants, and the consulting surgeons,



to refuse their consent to that operation, which alone could save our patient: thus I was destined to escape the opprobrium of having shortened the life of a man, whose death, from a very different cause, was inevitable.

“ He was perfectly sensible during this preliminary operation, and would most willingly have consented to any measure we might judge expedient. But, when he was conveyed to bed, he seemed weak, his breathing was low and difficult, his pulse, which had beat 124 in the afternoon, was this evening extremely feeble and slow, and he broke out into a very profuse sweat. His features were shrunk, and his face pale and ghastly. About four in the morning he was seized with sickness and severe vomiting, and with a rigour, which lasted fully twenty minutes, and at eleven in the morning his breathing was extremely oppressed; it was painful to witness his struggles for breath, and the anxiety and cold sweats which it brought upon him: in half an hour after his most violent struggle for breath, he was seized with a profuse hæmorrhage from the lungs, brought up, with coughing and struggling, fully a pound of florid blood, and expired. Thus, in the very moment in which he came into manifest danger from suppuration of brain, he died from the bursting of a blood-vessel in the lungs. What bruises, besides the wounds of the head, he may have received unconsciously in his state of intoxication, we do not know; but nothing is more likely, than that in the fall which thus hurt his head, the lungs had also suffered material injury; it is perhaps from such injuries passing unnoticed, that suppuration of the liver so frequently accompanies fractures of the scull; indeed, I know not how a man can fall from a height, without so heavy a viscus as the liver suffering by the shock, independent of any direct blow.

“ The appearances on dissection were as follow: The appearance of the brain implies danger; but it was the dissection of the lungs that explained his sudden death. Upon raising the cranium, all that surface of dura mater which lay under the diseased bone was in full suppuration, covered with white and mature matter, and, in many points, perforated with ulceration. The pia mater, in contact with the diseased dura mater, was not yet ulcerated, for the brain cut sound and firm up to the very surface; yet the whole mass of the brain was in some degree affected, an increased action of its vessels had unquestionably taken place, for all the ventricles were enlarged, and full of serum, but not obviously inflamed. Thus our patient was in that state of danger from suppuration of the brain, from which so few are recovered even by the most timely operations; but the sudden bursting of a great vessel in the lungs

was the immediate cause of the death; for, upon opening the right side of the thorax, there was found in the lungs of the right side a great effusion of blood, and a small superficial ulcer on the largest lobe of this part of the lungs."

Whether is it to the mere laceration of the scalp that we are to refer all this disorder? Was the scalp so mangled by the sharp and irregular stones among which this man had fallen; was it perforated in so many places by these irregular wounds I have mentioned, as to destroy its texture, and make it no longer capable of maintaining its connection with the skull? Or, was the bone itself so much injured in its internal structure and circulation as to be incapable of pushing out granulations to meet those of the scalp? Does not the practice here pursued, of holding the scalp in its place, of supporting partial adhesions, and endeavouring to extend them by using compresses, and confining the inflamed scalp in contact with the diseased bone, tend rather to increase that inflammation, and indeed to widen the separation? Were not those symptoms of shiverings and languor which (slight though they be) indicate suppuration of the brain, too long neglected? Should I not in place of making successive openings, when new abscesses were generated, have thrown down the scalp to examine the bone? Should I not, according to the strict rules of good sense and good surgery, have proceeded to trepan a skull, carious to such extent, unequivocally dead, quite incapable of maintaining any connection with the dura mater, sure, on the contrary, to operate upon it as a foreign body, and to produce suppuration? For this was not one of those circumscribed and superficial exfoliations, which can be thrown off without danger to the brain. Finally, since this patient survived so horrible an injury for three weeks, and died by a sort of accident, is not the long delay of this fatal suppuration a sort of proof, that it happened not from primary separation of the dura mater detached by the shock, nor by a secondary separation depending on slow disease of the bone, but from this destruction of the scalp, followed in succession by death of the skull, and suppuration of the dura mater, the internal periosteum of the skull?

Though I regard every fatal case as an occasion of reflection, and almost of self-reproach, yet I am sensible that this case was too complex not to admit of many apologies: There are in such cases of lacerated scalp certain irregularities and anomalies which incline me at all times to proceed with caution. There are conditions of the individual systems, and varieties of climate, or air, which, without any local cause, without the scalp or the skull being essentially ruined in their texture, prevent their reunion, and even occasion death. The air of particular countries

has been remarked through ages as peculiarly noxious to those wounded in the head. Lusitani has celebrated "the noxious air of Florence and Bologna, while the air of Ragusa, seated upon a rock, is so extremely favourable, that even where the cranial bones are fractured and destroyed, hardly any patient dies, but all recover."

The ill air of an hospital is more fatal to the re-union of the scalp, than either the bruising of the scalp, or the injury or contusion of the bone. The air of the hospital, the Hotel-Dieu, in Paris, is more noxious than the climate of Cremona, Florence, or Mantua, and has been a matter of regret in all ages. The good old surgeon, Saviard, shows us what danger there is in making even the slightest incisions, by a case instructive in many respects.

"Nurse Bernard of the Hotel-Dieu, no more than twenty-three years of age, was struck on the back of the head by the falling of a poll, set up for drying cloaths, and fell senseless to the ground. Upon giving her a little eau de vie, she revived, when there was observed upon the injured part a small bump only, of the size of a nut, and without any wound.

"The same evening she vomited, and was oppressed at intervals with a degree of stupor, which having continued four days, we became anxious, (says Saviard), and resolved to open the tumour, which was full of coagulated blood, the pericranium adhering soundly to the skull beneath. From this time forward she had irregular shiverings, which lasted at each return four hours uninterruptedly; and during the seventeen days in which they continued, we reckoned twenty-five returns. Bleeding we were so little sparing of, that in the first days of her illness we bled her no less than fourteen times in the arm, and once in the ankle; her vomiting continued incessantly, accompanied with pungent pain in the region of the liver.

"After the seventeenth day, gangrene came upon the wound, which forced us to make repeated incisions; bad symptoms continued, notwithstanding, for forty days, and two months and a fortnight had expired before the wound closed. Nor did her sickness end here, for shortly after the closing of the wound, her face was puffed up with an œdematous swelling, much serum running continually by the ears and nostrils for fifteen days; deafness supervened, with lancing pains, and continued disorder of the head; more than a point of reddish matter flowed from the nose, and a rheum inundated the chest, and threatened suffocation to such a degree, that for a long while we looked for nothing but sudden death. It were impossible to enumerate (besides the twenty-six bleedings) the various medicines she used; it was by the frequent use of ass's milk



that her health was at last restored. Her pains in the head continued for two years, with beating of the temples which increased with every change of the weather."

Without having the misfortune to have served in any hospital, where, to use the language of Saviard, "I saw innumerable victims," or, being driven to absolute despair, like Dessault,\* and abandoning all hopes of being useful in wounds of the head, I have yet learnt a degree of caution, with which I would fain impress you in your first conceptions; for of all the abuses of practice, the most grievous to one who reflects soberly and modestly on what art can do, is the confident and presumptuous hope which young men are too apt to indulge, of re-uniting every piece of lacerated scalp by the main force of sutures, and relieving every symptom of oppression, or slight delirium, or temporary fever, by trepanning the skull. I have often observed, that though the season seemed favourable, the heat moderate, and the air of an hospital untainted; while other patients, and less important wounds, were recovering apace, and no sign of infection could be perceived, those wounded in the scalp became, after a few days confinement, languid, feverish, and oppressed, and had every usual symptom of an oppressed brain. Not to specify innumerable cases, from which my general observation is deduced, I have seen a boy whose scalp was lacerated so very largely, as to shew the skull naked, but uninjured, continue well, and free from fever or delirium several days, then seized with vomiting, like that of oppressed brain, with rigours and foul tongue, and rapid pulse, and delirium. I have seen a boy lying in this doubtful and dangerous state for fifteen days, the suppuration of the wound being interrupted, and its complexion as much affected as the general health, exhausted by successive paroxysms of fever, and yet in no imminent danger. I have seen three soldiers hurt, in the confusion of a fire, from bricks or beams falling on them, all the three wounded in the head, all seized at once with the same temporary fever and delirium, and yet not one of them in any kind of danger. I have often seen, in an aged person, where the skull was laid bare by a blow, the integuments slough entirely away, and fall off in cakes as black (to use the expression of nurses) as the soot on the pot, and, after an interval of imminent danger, in which even the outer plate of the skull has exfoliated, I have seen with admiration the skull push forth its granulations with such vigour in extreme old age, (at seventy-five years of age) as to replace the scalp with a broad and firm

\* Dessault was so unsuccessful, that at last he renounced all thoughts of operating in fractures of the skull, and with a few ordinary precautions and remedies, abandoned every such case to nature.



*cicatrix*. These accidents of fractured skull, or lacerated scalp, are frequent only in an hospital; and you will often observe your patient, whatever his age or constitution, attacked with sickness or fever, which seems to imply danger, but which is to be cured by antimonials, opiates, and the warm bath. "Never permit yourselves to be alarmed too much at these first symptoms of fever, nor hurried into any precipitate step, for many have narrowly escaped the knife and the saw, the scalping process, and the useless perforation of the skull, to whom, during the continuance of such a temporary fever, the slightest of these operations would surely prove fatal."

That aphorism of Hippocrates, which relates to the fever of intoxication, may be transferred, without reserve, to that accompanying wounds of the head. "If a man be so intoxicated, as to lie speechless, and he be seized with fever, he is in no danger; but if not seized with fever, he dies the third day." We may, with much greater truth, pronounce the patient safe, who, having a wound of the head, has his delirium and vomiting explained by concomitant fever; while he who has the slightest shiverings, a less perceptible oppression, and no concomitant fever, is in a doubtful state.

But that a wound of the integuments, naturally slight, and void of danger, may, by misconduct, cause not merely caries of the bone, but suppuration of the brain, the following incident will prove to you. "A young man of seventeen years of age, was struck in play, by one of his companions, with a small stone on the left side of the head, over the parietal bone. He put himself into the hands of a sort of surgeon, who dressed this slight wound with a heavy hand, cramming it so with rough lint, that the sore rankled and inflamed, with a daily wasting of the integuments. Yet the boy was well in all other respects, went daily to market, and served his master with his usual alacrity. I saw this slight cutaneous wound at the time of his first committing himself to the hands of the barber, with whom I at the time remonstrated concerning his coarse manner of dressing the wound; but he replied, "That it was the duty of a surgeon to be cruel, and not faint hearted." It was because the wound seemed so very slight, that I gave up attending the lad, but on the eighteenth day, he came to me of his own accord, desiring me to see how things went on. I found all the surrounding integuments fistulous, down to the bone, and there was one great abscess, full of putrid matter, which could not be emptied but by pressure of the hand. I, of course, advised that this abscess should be opened at its lower part, which the surgeon promised to do.

"At this time I had no fixed quarters, but was obliged to

follow the royal army, so that I was prevented from seeing the patient for some time; but, about the twenty-fifth day, I was called to him, and his friends mentioned to me, that the fever which I found him in, had continued four days. His eyes were heavy and swelled; he was in a sort of stupor, and was reduced to extreme weakness. The sinus was still unopened, and contained very fœtid pus; for this blockhead of a barber had, either through pride or fear, altogether neglected what I advised.

"I had now no reason to doubt that the brain was affected, and proposed that the integuments should be laid open, and the bone perforated, thinking a doubtful remedy preferable to certain death. But the presumptuous fool, when he heard that I had proposed to perforate the skull, protested, "That if it were not for the fever, or if the fever should cease, he could make the cure of the wound a very easy matter.

"On the twenty-sixth day, this young man expired; I requested that his body might be opened, and the empyric consented with all possible alacrity, assured in imagination that his patient's death proceeded merely from fever, not from any injury of the head; and in this presumption he was hardened by recollecting, that from the first there was no sign nor appearance of any injury to the bone.

"Upon opening the head, the cranium was, indeed, found free from fracture; but there was found betwixt the skull and dura mater a considerable quantity of matter, the brain being at that place suppurated, and melted into pus."\*

Thus are we assured, that the mere detachment of the scalp (if it continue detached) will destroy the skull, and endanger the brain; for, though it has (in the dura mater, and in its own structure) various sources of nourishment, though it is little injured by a temporary or partial privation of blood, yet the permanent separation of the pericranium manifestly kills, destroys at least, the outer portion of it, and sometimes its whole thickness. In the older times, when the doctrine of exfoliation prevailed, when they were in the practice of cutting off the scalp, so as to occasion the death of the skull, when the separation of the dead part was mistaken for an essential process in the cure, it was reckoned the duty of the surgeon to procure exfoliation in every wound of the scalp; and he attained his end by removing the scalp, and by scraping and cauterising the bone.

In modern surgery, nothing is to be seen at all corresponding with this; the scalp is never, by any accident, kept separate from the skull, unless it be by an effusion of blood.

These effusions happen in rambling school-boys, and are of

\* Botallus, p. 736.

such a description as might tempt the inexperienced surgeon to open them. Whether from opening such tumours any ill consequences might result, I shall not venture to predict, and do not by experience know. But of this I am assured, that if left alone they are generally safe; that if the young surgeon were to yield to the suggestions of his own fear, whenever in those cases he imagined he felt a depression, and were upon this presumption to cut open the integuments, and trepan the skull, the issue of his adventure would be very often fatal. The deception proceeds from this peculiarity, that where the vessels ruptured by the fall have made the greatest effusion, the blood continues long fluid; but, towards the margin of this cavity, where the cellular substance is not entirely detached from the pericranium, the blood is so injected into the cellular substance, and mixed with its fibres, that the basis and margin of the tumour are uncommonly firm, and the hardness such as actually to resemble that of bone. From this hard circumference, the surface apparently declines towards that part where the cranium is more distinctly felt through the fluid blood; and the declivity is so distinct, and the hardness of the margin so entirely resembles that of the centre, where the skull is felt unequivocally, that the surgeon has not the slightest doubt that he feels a wide and deep depression of the skull; and when along with this the boy lies oppressed, and vomiting, he can hardly refrain from opening the tumour, or think himself vindicated in leaving the boy without help.

I know no deception which experience so effectually corrects as this, of an apparent depression felt through a bloody tumour of the scalp; nor can any thing but experience correct it; for to the sense of touch, the depression is so palpable, and the boy's danger so very obvious, that even an experienced surgeon, on any new occasion of examining such a tumour, is confused with the very peculiar feeling of that deception, which he is already aware of. Many times I have been called to rambling boys, who had fallen in climbing walls, or in playing about saw-pits, and unfinished buildings; and have often found them with great effusions of blood over the parietal bone, and apparent depression; the face ghastly, and the extremities cold, in a state of insensibility, with the eyes not closed, but turned upwards, as in the convulsions of children. But, fortunately for me, the case of the boy that I first saw lying in this stupor, in the earliest part of my practice, was so perfectly decisive, that I have never since been in danger of any precipitate step; for this boy, who had fallen from a garden-wall, lay in a state of absolute stupor, and with a degree of convulsion, during four days. He vomited incessantly, and his extremities were cold,



and his face ghastly. The appearance of depression was so striking and singular, that I made not the slightest doubt, that if he did recover without any operation, manifest marks of depression must remain. But he recovered in a few days perfect health and spirits, and the appearance of depression vanished, as the blood was absorbed.\*

I know not whether any specific and unalterable rule can be proposed for the treatment of cases so various in their forms, their causes, and probable effects, but something I feel inclined to say on this subject. When the tumour assumes the proper form of aneurism,—when there is a large and circumscribed tumour, fluid blood in the centre,—a hard basis and margin,—a distinct pulsation through the whole tumour, and its size increasing from day to day, there is great danger to the skull: the tumour should be laid open without delay, and dressed with lint; and it will, after two or three days of suppuration, (in which the matter will be fetid, from being tainted with the blood), heal kindly; for the arteries of the scalp, when thus bruised, and pouring out blood, have sufficient force to maintain, or even to enlarge, the effusion of blood which cannot be absorbed, in opposition to such a cause. Yet, when opened. such arteries do not bleed much, the hæmorrhagy is suppressed merely by applying a bit of lint; they rarely need to be tied.† *Lastly*, Effusions of blood, though unaccompanied with pulsation, if they continue fluid, and do not gradually subside from the period of the sixth or seventh day, must not be regarded as of a slight or indifferent nature, and, before the tenth or twelfth day, should be opened. From all the experience I have had, these rules of conduct will be useful to you; and while I warn you to refrain in general from opening such tumours, it is also my duty to state unequivocally and plainly, that there are others which occasion caries of the skull, where a little imprudence, a little delay, endangers the patient's life.

“ Mr. Harrold, partner to Mr. Wilmer, had a boy brought to him, of fourteen years of age, with a tumour on the crown of

\* Though the author's practice, in this case, was successful, I should not be disposed to imitate it. It is certainly exceedingly difficult, in these cases, to ascertain by the feel alone whether the bone is depressed or not, a point of the greatest consequence to ascertain; and as I know by experience that no injury results from laying open such tumours, even though the bone should not be injured, I should recommend it in every case where the tumour was considerable, or from circumstances attending the accident, there was reason to apprehend an affection of the skull. S.

† The hemorrhages may be restrained by a compress, and the bandage recommended for the head, (see Discourse on Bandages p. 39—40.) provided the artery be completely divided, which alone will be in most cases sufficient. This Bandage is particularly adapted to those cases, in which the scalp has been separated from the cranium. S.



the head, the size of a hen's egg. It was seated on the middle of the sagittal suture: it was occasioned, as his father related, by a blow, the boy having been struck over the head with the arm of a broken chair: the swelling ensued immediately after the blow. The father had flattered himself with hopes of its dissolving by time, and the simple remedies recommended by his neighbours; but about two months after the blow, he brought the boy to Mr. Harrold, the tumour undiminished, and containing, according to Mr. Harrold's apprehension, nothing but blood. As a measure of precaution only, and without apprehending the disorder which had already been produced, he opened the tumour with a long incision, and discharged a quantity of blood, yet fluid, and not in the slightest degree grumous nor blackened; and, as the artery from which it had flowed was still open, and a considerable hemorrhagy ensued, he dressed the cavity hastily with dry lint.

"On the second day, he removed the external dressing; but, not chusing to risk a second hemorrhagy, he left the lint which adhered more immediately (and very strongly) to the surfaces, untouched: when this also was removed at next dressing, much ichorus and putrid matter was discharged, and, upon looking into the bottom of the cavity, was surprised to percieve distinctly the pulsations of the brain, and that the bone was entirely wanting in all that part which corresponded with the basis of the tumour, a space of two inches in diameter." The danger of this boy, then, was most conspicuous and imminent; fortunately the dura mater granulated, and the opening healed kindly.

Such are the dangers proceeding from delay, those arising from misconduct are no less to be feared.

"A school-boy, having his hair severely pulled in a quarrel, there rose a small bloody tumour of the scalp, which he concealed for three weeks, till it had extended from the size of a pea to that of a large tumour seven inches long, and four inches broad, rising very high in its centre, and covering much of the parietal and frontal bone. This was an aneurism too large to be void of danger, and required decision in the opening of it, and delicate dressing to prevent ill consequences, and bring it to a right suppuration. Mr. Hill of Dumfries was desirous of having it opened with caustic. The gentleman who had him under his care preferred the lancet. Upon puncturing the tumour, four inches of pure and florid blood flowed from it, and the pericranium appeared entire. Mr. Hill now proposed a loose bandage, till the parts should have time to contract; but again, says he, "I was overruled, and a thick compress was bound down over the tumor, and a dossil put into the orifice." Next day, the integuments had adhered closely to the pericranium,

and a full sac was formed at each end ; and, to discharge these, the gentleman tore up the scalp, by thrusting a probe under it, and then renewed the compress. On the third day, the sacs were again filled, the parts adhering so firmly, that the probe could not be introduced, though he tried it several ways, and with so much force, that the bone was laid bare in three places.

“ Then followed an œdema over all the scalp. The gentleman to whose care the case was committed being out of town, the sore was neglected for three days ; the swellings increased ; there was much pain, fever, sickness, and a degree of delirium and raving. On the fourth, two caustics, notwithstanding the inflamed state of the scalp, were applied ; and on the fifth, the bloody and purulent matter being discharged, and a fomentation applied all over the head, the delirium subsided, and the swelling soon vanished. There were now three openings, each of which continued to run for many weeks, till the bones which had been laid bare exfoliated.”

Before I forsake this subject of injuries external to the cranium, I shall represent to you one which is attended with no danger of caries, but relates to the scalp only, a nervous and most singular disease ; resembling that which arises from some injury in bleeding in the arm, attended with little danger, but marked by convulsive motions, nervous affections of the most undefinable nature, and sometimes with agonizing and periodical pain ; pain varying according to the state of the weather, or the patient's health.

“ The man whose case I am going to relate to you, was about thirty-two years of age, sallow, sickly, and, I fear, dissolute. He had lost his health, his industry, and his morals, by an unfortunate blow on the head, which had deprived him of reason for many months ; and, after a second blow on the head, he suffered, in consequence of the sewing of the temporal artery, a very singular nervous affection.

“ First, about three years ago, he was attacked by some drunken companions of his own, who, knowing he had in his pocket thirty shillings of wages, and he refusing to treat them, way-laid him in a dark passage, and knocked him down in revenge. He fell backwards into a cellar-stair, struck the back of his head against the stones, and was carried to the hospital senseless ; where, notwithstanding every care of the surgeons, he lost his reason, continued many months insane, left it at last in a weakly and languid state, ill able to return to his hard labour, that of press-man in a printing-office. From that time he wrought little, and irregularly, became a miserable vagabond, subsisting chiefly on charity, and living among his friends.

“About three months ago, as he was coming down an open stair, which had no hand-rail, and was so dangerous as to have been the occasion of frequent complaints to the landlord, he fell over the stair, and lighted among sharp stones, and his forehead was laid open with a ragged wound, about four inches in length, extending from the forehead to the temple.

“The stair was notoriously dangerous, and the night dark, but he confesses that he was a little tipsy. Nothing so surely indicates a vagabond and idle life, as indifference to cleanliness and health; he did not return to his old asylum, the hospital, but, with a penny-worth of Wade’s balsam, and some filthy apparatus of rags, made a fashion of dressing his wound, till, by filth and neglect, it ulcerated; the temporal artery was eroded; the blood sprung briskly from the corner of his sore, and thus he was brought to the infirmary.

“The house-surgeon sewed the artery; he was laid in bed, and enjoined not to stir, lest it should burst out again. He was very timid by nature, and the students took a pleasure in alarming him from time to time, with saying, that it would surely burst out again. About a fortnight after, the ulceration still extending, the artery was again eroded; and at night, betwixt ten and eleven o’clock, when turning gently in bed, he felt his forehead moist: and, upon putting up his hand, found it wet with blood. The artery soon began to bleed *per saltum*; and the house-surgeon being called, the artery was again secured, by striking a needle and ligature under it.

“After the first sewing of the artery, he felt nothing unusual; but after this second stroke of the needle, he found, next morning, his mouth pursed up and contracted, his jaws so clenched that he could not speak, while spasmodic contractions extended along the neck and throat. His cheeks were flattened, and his mouth pursed up, and at the same time protruded as in a ludicrous *simpre*, or like one attempting to whistle, and prevented by an inclination to laugh. The form of the face was remarkably changed; the sphincter oris pursed up the mouth, while the zygomatic and triangular muscles retracted the corners of it, and made the dimple natural to that part very deep; the cheeks were flattened, the mouth protruded; when he attempted to speak, which he did imperfectly, the whole face was agitated, and his tongue got entangled between the upper and lower ranges of teeth, so that he imagined, if he persisted, he might bite it across; and the throat and the whole neck was obviously contracted in a spasmodic state, accompanied with remarkable pain; and he could not open his jaws to receive the smallest particle of food, but lived on spoon-meat.”



Having pointed out with deliberation, and, I hope, with precision and clearness, the various injuries of the scalp, I hasten now to a subject more interesting in an infinite degree ; I mean, the consequences resulting from a separation of the dura mater from the internal surface of the skull.

## SECTION III.

*Of Separation of the Dura Mater.*

The blow which detaches the dura mater, may at the same time injure the integuments, or affect the skull ; hence nothing seems more difficult than to ascertain the simple consequences of separation of the dura mater, unallied with injury of the integuments or cranium. Yet I hope I shall be able, by a suite of facts, to prove, that the dura mater may be separated even by a shock, without any direct injury to the scalp, or skull, and to explain to you all the varieties of this accident, and all its remote and unforeseen consequences.

“ A little boy, of five years of age, fell from the first storey of a stair, but lighted on his feet, and walked up stairs again, saying that he was not hurt ; no importunities, questions, or threats on the part of his parents, could ever extort from him any other answer, than that he was not hurt ; indeed, they had little reason for their anxiety, the boy appearing to enjoy, for three months, the most perfect health. But, at the end of the third month, he was seized with a violent headach, accompanied with a puffing up of the eye-lids, and fits of vomiting : and when the surgeon was called, he found the face suffused with a purple colour, and the boy deprived of speech, and able only to point with his hand to the place of the pain. He was bled in the arm without loss of time ; he grew worse, and was, a few hours after, bled in the leg, but almost immediately, and before the orifice was closed, he expired.

“ Mr. Casaubon being called to open the body, found without the cranium nothing particular, except a slight puffiness of the integuments ; but, on opening the skull, he found an extensive abscess betwixt the dura mater and the inner surface of the right parietal bone ; but neither within the skull, nor in any other part of the body, was any thing remarkable observed.”

Here we have presented for our consideration, in a short plain narrative, a suite of most important facts. *First*, A boy falls from a great height upon his feet, as it would appear, in the presence of his parents, but certainly upon his feet ; and the dura mater is detached, not by a blow, which might at once injure the cranium, and shake the dura mater ; it is detached by



the shock merely, without any concomitant injury of the skull. *Secondly*, The integuments being sound, the cranium unhurt, the parts not disposed to run quickly into disease, the child continues in perfect health, and when he is suddenly seized with the fatal signs, there is still no conspicuous swelling of the integuments; and, when he dies, the cranium is found in its natural state. *Thirdly*, It is remarkable, that here, as in almost every instance, the suppuration of this membrane is slow and insidious in its progress; for this boy had continued three months in apparent health; no symptoms betrayed the danger: the parents had dismissed their first anxieties and fears; yet all the while this fatal suppuration was ripening. The boy, the moment he is seized with the stupor, is gone, past remedy. The trepan could not then have saved him; the cause of this sudden and fatal convulsion was discovered only after death. *Fourthly*, Though the suppuration was of considerable extent, (un absces considérable) it had plainly arisen from the mere separation of the dura mater; for the dura mater alone was affected; long as it had been divorced from the cranium, neither was the cranium affected by this separation, nor the brain by the disease of the membrane which immediately surrounds it; the separated surface was alone purulent.\*

In one of the following states and conditions, the dura mater always must be after a violent separation from the internal surface of the skull: *First*, Either, the bone being hurt, (as generally happens in cases where it is shaken by a blow) the dura mater cannot re-unite, its surface will suppurate, and the patient die, with shiverings, stupor, and palsy; or, *secondly*, the dura mater may continue separate, and yet its surface heal, but with a disposition to form fungi, which betray its unhealthy condition; for the cranium, by pressure on its lower surface, becomes carious, part of it is absorbed, the fungus begins to protrude through a small circular opening, and the fatal sign of pulsation in the tumour, is felt, which pulsation is, indeed, the motion of the brain: then the opening enlarges, the fungus increases, the brain is at the same time diseased, and sometimes suppurates, and the patient, seized with stupor, with epilepsy, sometimes with howlings, and the most horrible convulsions, expires.

In the German Ephemerides, is to be found a case farther confirming this singular fact of the separation of the dura mater by a general shock; and that the surface which remains de-

\* This case proves how slow and insidious suppurations of the dura mater are, but by no means that this membrane can be separated by a shock: the contrary I take to be the more probable inference; for had it been separated by the accident, and had not re-united, suppuration must, I think, have immediately taken place. S.

tached, forms fungi, and destroys the skull. "This man was about fifty-one years of age, fell from his horse, and was sensible of a violent concussion of the head; a distressing pain ensued, but it soon vanished, and the patient thought no longer of his fall, nor of this pain. About four years after, he became conscious of a loss of memory; and this malady increased so, from day to day, that he at last forgot what he had said or done the moment before. Then came cruel and incessant fits of epilepsy. Those paroxysms seemed for six months to be appeased by the medicines he took; but there followed next pains of the head, excruciating, unremitting, and continual, which no remedy could alleviate, and which, in six months more, proved fatal; and so dreadful were these pains which affected the left side of his head, in the form of megrim, that the left eye was convulsively turned in its socket, by the excess of pain.

"On opening the skull, the middle and fore part of the right parietal bone was carious, and destroyed in a space equal to the size of a half-crown. Lesser spots of caries were observed in various parts of the skull-cap, while the left parietal was corrupted by a fungous excrescence from the dura mater, which extended towards the orbit, and had destroyed also the cribriform plate of the æthmoid bone."

Here we see again the sudden shock separating the dura mater, perhaps to a great extent from the skull. The bone dying, and falling into general disease, by the loss of its nourishing membrane; and that fungus (which it seems the peculiar disposition of the dura mater to produce, when healed apart from the cranium) destroying the parietal bone, making its way through the thin plate of the æthmoid bone, and causing death before it had growth sufficient to produce an external tumour.

In speaking of tumours proceeding from within the skull, I have been insensibly led on to this subject, by considering the various consequences of this separation of the dura mater; and my object has been to impress you with just and serious fears of entering upon any surgical enterprise, where such tumours arise from within the skull. The cases which I have already detailed, are not merely destined to adorn the works of a learned society, or to be a matter of stupid wonder, but to serve as useful warnings; they are forms of disease, horrible, indeed, in their conclusion, but in their beginnings, hardly to be distinguished from the most trivial tumours; and that surgeon is in great danger who does not, from reason and reflection, (for experience few can have in such rare cases) form a decided opinion the moment such a tumour is exposed, who does not resolve, with a steadiness not to be shaken, "not to touch it for

the world." The good that can be done is problematical, the danger dreadful; and the surgeon who but allows himself to consult upon such a case, or to hearken to the intreaties of a patient weary of existence, is in danger of robbing him of life. The disease, it must be acknowledged, is fatal in the course of nature; yet, wherever an operation has been attempted, it has uniformly accelerated the death of the patient.

Let these facts, then, stand to you in place of experience. Examine, with a scrupulous and jealous precision, into the history of all tumours seated on the head. Regard, as suspicious, those which are connected with venereal affections, with blows, or falls, or concussions of the head. Regard, as peculiarly dangerous, all tumours of slow growth, of deep pulsation, receding within the cranium, covered with puffy scalp, and causing, upon being repressed, not pain, but sickness, confusion of head, convulsions, and tremblings of the limbs. When the skull is first destroyed, and the brain, or the internal tumour protrudes, a temporary relief sometimes ensues. Occasional ease is sometimes procured by gentle pressure, and equable support, but the event is inevitably fatal; and frequent swoonings, insensibility, coma, or quivering of the limbs, an involuntary discharge of urine and fæces, delirium, and convulsion, close the scene. Touch no such tumour, at the peril of your reputation; for, it is either a caries of the cranium, through which the brain protrudes, or an aneurism from without, or a fungus from within, which has destroyed the bone.

Let us now return to reflect on one indisputable fact, and it is this: Within the proper structure of the skull, the circulation is so vigorous, and its sources of blood so varied, that the bone by no means depends on any one set of vessels for nourishment, nor even on that which seems the most essential to its health, the *dura mater*. Almost the whole of the *dura mater* may be separated from the internal surface of the skull, and yet the union be restored. We often, upon applying the trepan, perceive that the oppression of the vital powers proceeds from an effusion of blood under the skull, compressing the brain. The blood is hooked out with probes, washed away with mild injections; diluted by the natural secretions, and by the purulent discharge from the suppurating surfaces of the *dura mater* and skull; and the clotted blood being thus dissolved and discharged, the surfaces unite again. We are often persuaded, by the quantity of the extravasated blood, that it must have covered the whole hemisphere of the brain, up to the sagittal suture. We sometimes feel the extent of the separation, by introducing the probe; but we seldom have so clear a conviction, as in the following case of the whole extent of the *dura mater*,



of the whole internal periosteum of the skull being detached. "A young man, of about thirty years of age, was struck repeatedly on the head with a crab-stick, and with a loaded whip. Next morning, he was found lying in a state of profound lethargy, and with his right side paralysed, but without the slightest appearance of fracture, or depression of the skull. The marks of the blows being chiefly on the right side, that side (contrary to a well-established rule) was first trepanned, and the dura mater was found disengaged to such an extent, as to contain, at least, six or seven ounces of blood, betwixt it and the skull.

"This first perforation gave him some respite, but his friends resisted all further attempts to relieve him, till four days had elapsed, when there appeared no longer any hopes of life, and he was left to die among the surgeon's hands. Then the left parietal bone was trepanned. The whole hemisphere of the brain was seen to be surprisingly compressed by a thick black cake of coagulated blood, of the consistence and colour of currant-jelly. The cake of blood extended actually from the falx, or sagittal suture, to the bottom of the os petrosum; in short, from the vertex to the base of the skull; and seemed to consist of the same quantity that was discharged from the other side, amounting, of course, to six or seven ounces of blood. Although it was not thought prudent to bring away at once the whole mass, yet, so much was discharged, that, upon speaking to the patient, he instantly looked up, like one awakened from sleep, named every one, and raised the arm, which had been paralytic, over his head; and much of the coagulum being removed, he recovered apace, so as to be able, by the fifteenth, to walk into an adjoining room; but by the accidental bursting out of an artery in the scalp, he was weakened, the confusion of head, and even the paralysis, in some degree, returned.

"Some days after this, his friends, despairing of his life, laid him on a litter, and, without acquainting his surgeons, (Mr. Hill, and Dr. Gilchrist, of Dumfries), carried him home, a journey of eight miles. The left side of the brain suppurated five or six times, each paroxysm of inflammation being accompanied with fever, stupor, and difficult deglutition, and relieved by an eruption of matter; and it was remarked, that when such suppuration formed towards the fore part of the brain, the candle appeared to the patient double; but when the suppuration was backwards, the light appeared to have a halos, or circle, round it; and after each eruption of matter, the candle appeared single and distinct. Notwithstanding these occasional interruptions, he was, in three months, compleatly cured; became the father of a family, and lived long in perfect health,



excepting a slight defect of memory, and slight convulsive twitches, to which he continued subject."

In this most interesting case, related by Mr. Hill, he had taken every pains to ascertain the extent of the separation. He found no apology for introducing his probe under the scull, on the right side, because the blood flowed freely out; but, on the left side, his probe, while hooking out the coagulated blood, passed from the trepan-hole, in the centre of the parietal, downwards, along the temporal bone, till it was stopped by the curvature of the os petrosum, and upwards again by the lambdoidal suture, all along the sagittal suture, and over the orbit, along the frontal bone; "and it is my persuasion," (says Mr. Hill), "that the separation of the dura mater was not less extensive over the right side."

What, then, are we to infer from these phenomena? Surely this: That, as lacerated scalp adheres readily with the external surface, the dura mater has an equal aptitude to re-unite with the internal surface of the scull: and these phenomena present themselves daily to the observation of the practical surgeon. He presumes, from the sudden oppression of his patient's senses, and the palsy of his limbs, that the dura mater is separated, by a shock, or blow, not slightly, so as merely to endanger suppuration, but to such extent as to cause a great effusion of blood from all its vessels. He trepans the scull, and by the general pressure, and rising of the brain, the blood is, (as I have generally observed it) spued up in grumous clots, through the trepan-hole. He puts in his finger,—turns it round,—feels no solid resistance, and is conscious that the dura mater is much depressed, and the effusion of great extent. Sometimes he finds a cake of solid and firm coagulum, which bears the pressure of the finger. At each dressing, he introduces his probe, binds it, and turns it in every direction; by injections of tepid water,—by the help of the probe,—by the purulent secretion from the surface of the scull, and dura mater, the blood is gradually discharged, and by every mark it is certain, that the extravasation has exuded under the whole of one parietal bone, from the forehead to the occiput, and sometimes from ear to ear. Yet, by the secretion of pus, and by the heaving of the brain, the blood is entirely discharged, and purged away. The scull and dura mater are in a state of suppuration by the time they are allowed to approach each other. The dura mater is covered with a velvet-like pile of granulation. The margins of the trepan-hole, and (by inference) the internal surface of the scull, is covered with a similar pile of granulating flesh. The dura mater is, by the pressure of the brain, supported in close contact with the scull, and the surfaces are united, and the trepan-hole closed by a process of nature.

visible to the surgeon, in every stage, and expressly resembling the re-union of soft parts.

## SECTION IV.

*Of Contusio Cranii.*

As it is my wish that you should on this, as on all questions of practice, draw your own conclusions from fair descriptions and plain facts, instead of defining the essential change produced in the injured part of the cranium by a blow or contusion, I shall proceed to shew their effects.

“ A man (says Dessault) of five and thirty years of age, was struck with a bludgeon over the head ; a blow which stunned him for a few minutes, but did not knock him down. He had himself bled in the foot, drank of a vulnerary potion, believed himself cured, and continued well for a month. Then he sickened, lost his appetite, his tongue took on a yellow scurf, shiverings came on, he fell into coma, and died on the sixth day.

“ On dissection, (says Dessault) we found not the slightest outward mark of injury ; the scalp was sound, the external table of the skull had its natural colour, but the internal table was blackened through the whole extent of the parietal bone. The dura mater lining this part of the skull was of a colour still darker ; yet it adhered as formerly to this surface, as to that of the uninjured part of the skull, while all the lower surface of the dura mater was coated with an ash-coloured viscid pus, which not only covered the surface, and entered among the convolutions of the brain, but tainted its substance to the depth of several lines. The rest of the brain was sound and natural.”

There cannot be imagined a more perfect example, or shorter description of contusion, pure and uncomplicated. The integuments still entire, without even the slightest tumour, so that the bone had not suffered by any disease from without ; the dura mater still adhering, so that, unless the bone had been deadened by the blow, it might have preserved its circulation from within ; the bone alone had been injured by the blow, so as to affect, in its turn, the dura mater, which alone was inflamed and purulent, in consequence of the death of those parts. But yet an accidental description of Le Dran pleases me still more. “ A man, who had been wounded with a sword, continued well, and walking about in the hall of the hospital, till the seventeenth day, in the evening of which day he was suddenly seized with delirium and fever, and soon after died. The first table of the skull was divided by the sword, the second was only contused ; betwixt the pericranium and skull was a coat of a sort of purulent mucilage ; the same purulent mucus was lodged

betwixt the cranium and dura mater, and also betwixt the dura mater and pia mater.

“When I examined the cranium, (says Le Dran) I discovered the cause of this disorder. There was no fracture; but a *contusion*, about the bigness of a crown, was visible in the diploe, discoverable by a large black spot, which was of an elliptical figure, in a line with the cut in the external table, and surrounded by several black rays. I have preserved that piece of bone: and, although it is dry, and I have had it for some time, the black spot still appears upon the internal table, and not upon the external; but it is more conspicuous against the light.”

But of all the examples of *contusio cranii*, that produced by the grazing of an oblique ball, or the obtuse blow of a ball, whose force is spent, seems to me the most simple; no other kind of violence so effectually deadens a bone, nor so certainly draws after it fatal consequences. “A Lieutenant of the regiment of Haynault, (says Mr. Martiniere) was wounded with a spent ball a little above the right frontal sinus. The surgeon who first saw him thought it right to make a crucial incision, to display the state of the bone, which he found free from fracture or fissure. The ball had somewhat stunned the patient, but bleeding had relieved this symptom; and there seemed to be nothing to do but take care of the wound. But at the end of three weeks, the patient fell into a lethargy, with a hard and oppressed pulse. When Mess. Petit and Martiniere were called, they found his case desperate; yet they felt it to be their duty to apply the trepan. The perforation gave vent to a great profusion of pus; but, by being late performed, it was of no avail.”

I need not seek to impose upon you the authority of respected names, to confirm a theory which I have proved; but remark it rather as a proof of the ingenuity and good sense of Botallus, that he understood so well the invariable effect of a ball, in deadening the bone. He regards every gun-shot wound of the head, (that where there is merely a bruise, as well as that where there is a fracture), as an accident requiring the trepan. He represents the slightest touch of a ball as a kind of *contusion*, never to be neglected. He directs, that the piece so struck should be cut out with the trepan. He says, finally, that having seen some die, from such slight grazing of a ball neglected, he has, invariably, found pus collected under the dura mater, directly under the injured part of the skull.

The soldier who is struck obliquely by a musket-ball, whirls round, and falls. He lies as in a swoon. When he revives, he is cold, pale, with a haggard countenance, and wild and con-



fused air ; but he is soon able to get upon his feet. He is carried to a safe place ; there is found no external wound ; the integuments are livid, yet no inexperienced person would apprehend any danger ; but he continues pale, dispirited, and languid ; in a few days, the part is puffed up, and slightly swelled. He has then sickness, swimming in the head, cold shiverings, and nervous tremours ; and, upon making incision into the part, the bone is found bare, and often discoloured ; and if, upon the exacerbation of these symptoms, the trepan is applied, pus issues through the trepan-hole, and the patient is thus saved.

We cannot then but be struck with all the phænomena of contusion, and take an interest in them, for they are far from being rare ; and especially, we must be struck with the apparent slightness of the injury, a superficial wound, unattended, during many days, with either pain or sickness, or any sign of danger. We cannot but reflect seriously on the critical condition of such a patient ; the slight variations which mark the change from health to the most dangerous condition ; and above all, on the limited period in which it is permitted us to interpose successfully ; how precious the moments of reflection and consultation should appear ; how vigilantly the surgeon should watch over his patient, and mark those changes of the countenance, that expression of the eye, that mixed state of irritation and langour, those alternations of delirium and reason, those perturbed nights and alarming dreams, which no nurse nor hired attendant is qualified to report : and it is worthy of notice, that the matter of a suppurated *dura mater* is peculiarly ripe, i. e. yellow, viscid, and tenacious, (which is to be ascribed, not to the peculiar nature of those surfaces, but to the compressed state of those parts, and to the continual absorption of the humid fluids), from the moment in which such abscess is begun. And let us not forget, that it is but the uncertainty of the signs that suspends our resolutions, for this is an abscess which cannot, like any other, burst outwardly ; which, when once begun, penetrates rapidly to the brain, the most susceptible, and the most important organ ; so that there is but a moment in which the patient can be saved.

To watch the patient, and distinguish the signs, so as to interpose with decision, void of rashness, and seize the short interval that is allowed us, is the mark of professional skill.\* The

\* Undoubtedly a carious bone may, in any part of the body, remain insulated, surrounded by a fistulous and callous sore, but no where is this condition attended with such imminent peril and danger, as in the caries of the skull. That a contused and deadened part of the skull should remain thus unoffending, and unaccompanied with symptoms, is nothing but what our philosophy can easily explain ; it



true and lively manner in which Fallopius describes the mark for discovering contusion, and claims it as his own, will strike you very much. "Since," says he, "the contusion of the bone is very dangerous, how, say the commentators, shall it be known? not by the senses, not immediately after the fall, not till the third or fourth day." It is to be known, (says Vidius), by making an incision,—by the blackness of the bone. God have mercy on those, whose physicians think fit to wait the blackening of the bone. Why, bones the most cruelly mangled and depressed, contused, as they certainly must be, do not blacken, if treated with prudence and care; often, indeed, in wounds, the bone blackens, but that is through length of time; how, then, shall we presently know, when a bone is contused? I have not heard nor read in any writer the secret marks of contusion; but they are as follow:

"Look to your nails; remark their fresh and lively colour, white, tempered with red, but spotted with specks of a deader white. Those spots have been named by the Greeks *nebulæ*, by us *mendacia*; and exactly such spots appear in contused bone, red at first, but afterwards of this dead white; for the bone changes colour in its various states of life, death, and putridity. The colour of a living bone is white, delicately tinged with red; that of a dead bone, unmixed white; that of a putrid or carious bone, livid or black. This is the cause why, when you first lay open a bone, you find it of a reddish white colour; white, because its earth is of the purest; and mixed with red, because it contains the finer part of the blood, a sort of sanguineous vapour, which, as it is from the blood, is red. And this is my proof, and you may witness it, that when I scrape the cranium, I have scarcely penetrated the surface, when blood begins to flow; and so it is, indeed, in every bone.

"This being established, it follows, that during the first stage, i. e. during the two first days of a contusion, that part which is marked with these specks of blood is still alive. But the blood exhales by the third day; for then the contused parts are divorced, though without any visible separation from the living bone. They no longer hold a living connection with it, nor are nourished by a circulation of humours; hence the redness ceases, and the spots and specks become white, which is truly the colour of a dead bone. Thus do I recognize contusion by the change of colour; I recognize it also by its blackness; but this

implies no more than that the *dura mater*, if it escape the first shock, may secede so slowly from the deadened bone, as to lessen the danger; in short, that a contusion of the skull may terminate in mere caries. But this is no reason why we should depart from that just and important rule of the ancients, that we should in all cases of contusion, operate early.

is a mark too decisive, and too certainly fatal, to be waited for."

But as yet, I have related no fact, nor advanced any thing, which might lead you to conceive the notion of an injury affecting a part only of the system of a bone, of a caries of one only of the tables, and of an abscess of the diploe which lies betwixt them. It was what I myself never suspected; so that the occasion in which I first observed it was extremely interesting.

"A young man, in the prime of life and health, fell from his cart, and the wheel, passing obliquely over his head, slid upon his skull as upon a stone. The integuments were torn down to a great extent. There were three large and triangular flaps of scalp so ingrained with mud and sand, that the blood, hair, integuments, and skull, seemed baked into one mass of filth. The man was profoundly drunk; upon cleaning the flaps of the scalp, with the design of replacing them, the marks of the cart-wheel upon the skull, which was rough and scratched, were so visible, as to preclude all rational hopes of re-union; yet the flaps were nicely cleaned, replaced, and held together with slight stitches.

"That integuments so lacerated, and a skull so plainly injured, should recover, was not to be looked for; but the injured bone might exfoliate, as a mere caries, and the violence, besides, was of a peculiar kind, there was no fracture; the patient had received no blow by which the bone might be contused throughout; the injury was apparent on the surface only, and was probably limited to the external table of the skull. The external table might exfoliate, but it was infinitely more probable, that the caries should penetrate and affect the dura mater; and it was our duty to watch for signs of danger; and yet to trust to nature so long, as the injury seemed local, so long as it was possible that it might exfoliate superficially, and as a mere caries.

"The man, more astonished than hurt, was no sooner restored from his brutal state of intoxication, than he appeared to be in perfect health; there were no shiverings, no fever, no confusion of head during the day, nor delirium during the night; much as we were persuaded of his danger, it was only danger to be apprehended, no symptom as yet announced it. The suppuration from the integuments in such a case is profuse and foul; and, while such a lacerated wound, so ingrained with filth, is cleansing and granulating, it visibly mends, and the surgeon is too apt to indulge hopes, which are never to be realised. In this case, the integuments first thickened, as they always do, by inflammation; were next wasted by suppuration, and remaining still insulated, the edges became livid, and sloughed off, while the skull blackened more extensively; a slight fever was

inseparable from such a state ; his face was full, and his eye heavy and languid ; yet that was not much to alarm us ; but he sickened ; on the thirteenth, he was reported delirious during the night. We could no longer be responsible for delay, and he was trepanned ; and circumstances of the most singular nature, which I wrote down, (as always I have done by the bed-side of my patient), persuaded me on the instant that this was as truly an abscess in the substance, in the cancellated part of the bone, as ever a boil was an abscess of the cellular substance of the skin."

*Remarks in the time of operation, and after it.*

" The integuments, by retraction, by suppuration, and most of all, by the gangrene or sloughing of the edges and angles of the several flaps, were so wasted as to have left an extent of naked bone, as broad almost as the palm of the hand. The bone dry, and scabrous, was black in two places. The perforation was made near the centre of the parietal bone, on a point of bone black as a coal. In perforating the outer table of the skull, not the slightest tint of blood appeared ; it seemed dry through all its substance ; the saw-dust was black at first, and became white in the progress of sawing, and as dry as hair-powder ; it was easily blown away, and the working of the saw was like the cutting of button-moulds from a piece of horn. The whole skull was extremely thick ; the sawing, which was deliberately performed, was of course extremely slow ; at last thick and viscid pus spouted up round the instrument, and I had no doubt, (although I had before affirmed the dura mater and brain to be still unaffected), that there was an abscess ; that the operation was fortunate, and might eventually save the patient's life. But the most accurate probing of the circle with the point of a quill did not discover to us even a single point in which the perforation was complete. The inner table, to our utter amazement, was perfectly entire ; and there appeared, for a moment, no other rational explanation of this phenomenon, than that the inner table must have been fractured, permitting the pus to exude through some oblique passage, from an abscess of the dura mater, to the cancelli betwixt the tables of the skull.

" The crown of the trepan was again applied, and, under the impression of there being an abscess betwixt the skull and dura mater, it was turned boldly and freely, without fear of wounding that membrane, when suddenly there issued through the trepan-hole much blood ; and it was feared, that some ill accident had



happened, in short, that the dura mater was wounded. But, upon probing with the quill, the inner table was found still entire; there was every reason for sawing slowly and cautiously; and it was, accordingly, very long in cutting through. During all this stage of the operation, the blood flowed profusely; and, when the circle of bone was at last taken out, the blood and matter ceased to flow. The dura mater was seen white and clean, firmly attached to the edges of the boney circle, and no where suppurated; and every circumstance of the operation inclined me to examine the trepanned circle with particular accuracy.

“The circle of bone sawed out with the trephine was, except one, the thickest I had ever seen. The external surface was perfectly black; the hole where the centre-tooth of the trepan pierced this carious table, and all the sides of the same table, were of a dead, white, or ash colour; the cancelli were gaping and irregular, yet without any very particular appearance. But the inner table was red in its substance, and bloody in its edges.

“The state of the dura mater was, during the cure, the subject of my most careful investigation. There was, I am well assured, no abscess; its surface changed, and it went through the process of granulating without more matter than that which that process implies, and such as the exposed surface alone might produce. These descriptions, taken carefully from my case-book, require no comment. This at least is sure, that the inner table may remain sound, and full of blood, while the external table and cancelli are contused and dead; and I have no doubt, that this man was saved from most imminent danger. Every such caries should be trepanned; very slight indeed is the chance of such an injury being partial at the first, or continuing so; still less likely is it, that after penetrating just to the dura mater, it should be separated by an effort of nature.”

The following interesting case, communicated to me by my able and much-esteemed friend, Professor Jeffrey, and related by his nephew Mr. M'Dougall, who attended the patient in her last moments, will, I believe, be highly gratifying to you.

“A young woman, living then in London, about six and twenty years of age, was struck down by a smoothing-iron falling from a height, where it had been carelessly hung, perpendicularly upon her head. It struck her on the top of the head, on the upper part of the left parietal bone. She was conveyed to an hospital in a state of insensibility, and continued delirious for some time. She was bled, the head shaved, the wound in the scalp enlarged; and when she recovered her senses, she complained of a sense of giddiness, accompanied with pain of the head, which continued for many weeks. Of the state of



the bone she had never been distinctly informed, but could perceive at the end of some months, that the surgeon, or his assistant, at each dressing, attempted to extract a large piece of dead bone, which was moveable, and which they shook and pulled in various directions. During these attempts, the sore was dressed with lint, and a poultice was occasionally applied.

“She remained very long in the hospital, (eight or nine months), where her health having suffered greatly, the physician suggested to her the propriety of removing to the country. She complied with this advice ; and after three or four months spent with her friends, she returned to the hospital much recruited. Many and various attempts were now made to disengage the insulated piece of bone. Her health began again to decline, her appetite failed, she was greatly reduced by fever, fits, and profuse perspirations. The discharge from the carious ulcer, profuse as it had always been, was now greatly increased, becoming more profuse and extremely fetid, as she became weaker. Nourishing diet and cordials were not spared. She felt that her health could not improve in the air of an hospital in London, and resolved to return to Scotland, to live or die among her friends ; weak as she was, she actually performed this journey of 400 miles in a mail-coach.

“When leaving London, the gentlemen under whose care she had been, charged her never to permit any operation for the removing of the carious part of the scull. They remarked, that the bone, which was slowly decaying, would be at last disengaged by the ulceration and erosion destroying those parts by which it was surrounded ; that to this alone should she trust ; the process of nature, they said, was safe, and sure to happen, if she could but regain her health ; the expedient which would probably be proposed to her, of applying the trepan, extremely dangerous.

“On her arriving in Glasgow, and applying to Mr. Anderson, an eminent surgeon in that city, his opinion was so entirely opposite to this, he was so persuaded of the propriety of removing this insulated bone, (now entirely uncovered, and of great extent), that he remonstrated with the patient, argued with her friends, and assured all who had an interest in her, that the pain, irritation, diarrhœa, and fever, the want of appetite, and profuse discharge, could not fail to bring her soon to the grave : But still his advice was neglected, till at last her health manifestly declining, and her situation being in all respects hopeless, the operation was assented to.

“With the design of afterwards bursting up the corrupted part of the bone, he applied the crown of a very large trepan nearly on the centre of this extensive caries ; an operation which

was not accomplished easily, nor at once ; for such was the perverse and fretful temper of the patient, fatigued with pain and suffering, that she submitted very ill to the operation ; such, indeed, was her real weakness, that in place of completing the perforation at once, Mr. Anderson thought it prudent to allow two days to elapse betwixt the first and second application of the trepan.

“ By this central perforation, the insulated bone was converted into a broad ring ; it was of the form of a quoit ; and a second perforation, with a smaller crown of a trepan, would have divided the ring, have reduced it in the form of a crescent, and have enabled the operator to break up and extract the caries, without endangering the dura mater. But he was not permitted to complete his operation ; if there was either danger or pain in the operation, he had done all the harm, but was permitted to do none of the good that might have been expected. Though prevented from fulfilling his more important duties, he continued his charitable visits to the patient. He still hoped, in some period of pain, or from a deliberate conviction of her danger, that she would allow him to complete his operation ; but, wearied with opposition, and finding himself really useless, he at last withdrew.

“ It was from charitable motives only, to soothe and alleviate her distress, without the slightest hope or design of offering any more important assistance, that Mr. M'Dougall now agreed to attend her, and assist her friends in applying the dressings, and keeping her sore in the best condition. The state of matters at this period is excellently well represented in the following report by Mr. M'Dougall.

“ On removing the bandage and dressings, I had now an opportunity of seeing the extent and appearance of the disease. The scalp had ulcerated and sloughed off to the extent of five or six inches in diameter, exposing almost all the upper part of the skull. The insulated piece consisted of the upper and back part of the right and left parietal bones. It extended from the lambdoid suture behind, to within two inches of the coronal suture before. The sagittal suture was seen to run along the middle of this caries, which measured transversely five inches, and longitudinally three inches and a half. A great part of the external table of the loose bone had mouldered away, and the dura mater was seen through the trepan-hole, and through many ulcerations in the skull, covered with pale unhealthy granulations. The edges of the scalp were swollen, livid, and painful, and the discharge of pus was profuse, of a dark colour, and very fetid. The insulated piece of bone was immersed in matter, blackened on its surface, and incrustated with the discharge. I could easily

move this piece of bone a little way upwards or downwards, or to either side, the thin edges of it passing at each movement under the edge, or between the tables of the surrounding bones. It could even be depressed a few degrees, though the resistance to this was very considerable; nor did the patient complain of any uneasiness. It was this resistance that enabled Mr. Anderson to apply the trepan on the insulated piece of bone itself.

"Compresses had been applied to prevent the matter from descending betwixt the cranium and scalp, but without success. The matter had worked its way downwards, forwards and backwards, had destroyed the cartilaginous tube of the external ear, giving a free exit to the discharge through the external meatus, and had separated the scalp from the squamous portion of the temporal, from almost the whole of the left parietal, and from a great part of the occipital bone. The matter had descended to the neck, and formed a large collection there, which pointed; but the patient would not allow of a counter-opening. The application of compresses, to prevent its accumulation, was now out of the question, for the scalp covering the left and back part of the cranium had become livid, and extremely painful to the touch, and as thin as paper. A bent probe, when introduced under the scalp directly backwards, could be passed down to the neck, and made to turn round the convexity of the skull, till it was withdrawn opposite to the ear. The bone felt rough, and denuded of pericranium throughout this whole circuit. The matter exuded also from under the bones of the cranium, and had detached the dura mater from them to a considerable extent laterally, and downwards to the base of the skull.

"The ulcerated scalp was dressed morning and evening with a pledget of lint, covered with soft ointment. Tow was applied above the lint, to absorb the matter, and the whole was retained by a bandage loosely applied. At each dressing, about an English pint of a dark-coloured fetid matter, very much resembling coffee-grounds, could, with gentle pressure, be forced up from the neck, and from betwixt the cranium and scalp on the left side, and discharged at the large opening above. The scalp bled on the slightest touch, but the blood was almost without colour.

"The patient had at this time survived the accident twenty-three months. She lived about a month longer, her debility daily increasing till she died.\*

\* "I need not, Sir, send you a copy of my notes of the dissection; as nothing very remarkable presented itself. I may remark, that the dura mater adhered very firmly, where it was connected with the parietal bones anteriorly, and was in general much thickened in its substance. "PETER McDUGALL."



It is my opinion, that the carious bone of a member may be left, till it be discharged or loosened by nature ; but that when a vital organ, as the brain, is endangered by slow exfoliation, the bone should be removed as soon as it begins to shake ; that life being at stake, nature, when she makes the effort, should be assisted, but always modestly and delicately. There are circumstances, in which it is plainly our duty, not only by shaking and moving the deciduous piece, but by cutting and trepanning the skull, to remove it ; for, when the integuments have sloughed off ; when much, or the whole of the cranium is bare ; when the dura mater is ulcerated over almost all its surface ; when one separated piece of bone supports an ulceration and carries over a great extent of the skull ; I should (in hopes of removing that insulated piece of bone) proceed to the most dangerous and fatiguing (for these are not painful) operations, as freely as I should pull a thorn out of the flesh.

## SECTION V.

*Of Suppuration of the Brain, from whatsoever cause it proceeds, whether from Laceration of the Integuments, Separation of the Dura Mater, or Contusion of the Skull ; of the Signs of Danger, and the proper Time for Operating.*

You now perceive, that contusions of the cranium lead naturally to one of two forms of disease ; either to a mere exfoliation, a disease limited to the bone, and long protracted, yet in no period void of danger ; or a present affection of the dura mater, penetrating in a few days to the brain itself, and followed by very sudden death. If, in demonstrating to you the various affections of the lacerated scalp, separated dura mater, and contused bone, I have treated individually and distinctly of affections which are oftener combined, it is with the purpose, first, of proving, that they do happen independently of one another ; and, secondly, of accustoming you to reason correctly on the individual facts ; and teaching you to distinguish the peculiar constitutions and affections of each part, so as to be able to foretell the dangers resulting from each particular injury. But these parts having one common circulation, and a mutual sympathy and dependence, the blow which affects the bone, by contusion, must necessarily, in most cases, shake the dura mater, and deaden the integuments, and produce, by this complicated injury, symptoms different in complexion (and more immediate in their consequences) from any I have yet described. I have now to describe that form of contusion where the symptoms



immediately follow the injury ; where, though there is no external wound, nor apparent bruise, to intimate the patient's danger, there rises, after a few days of shiverings, and indescribable confusion of head, a puffy tumour, the surest mark of danger, and where in a few days more the brain is deeply affected, and the patient dies. I am now to explain to you the principles on which this case is to be resolved, the rules and data, according to which a consultation, the most solemn and interesting in our profession, is to be conducted. The confusion of head, shivering, and fever, are all too slight to alarm the patient or his friends, and his surgeon only can justly estimate his situation. The symptoms are too slight to allow the mention of an operation, esteemed the most hazardous in surgery, which yet must be immediately performed, else the man is lost without redemption. Not one among you, perhaps, is destined ever once to perform lithotomy, but there is not one of you who will not probably be called upon, in future practice, to decide upon the most difficult of all questions respecting injuries of the head ; to deliver before a jury a sentence on life or death ; to proclaim the motives and principles of your practice, your reputation being involved in the fate both of your patient, and of the criminal accused of his death. The phenomena which I have hitherto described, are chiefly those of caries, affecting only the bone, sometimes protracted for months or years ; but the train of symptoms I am now to describe, are those from which danger is inseparable.

A man, in a quarrel, or in a riot, is knocked down with a brick-bat, or bludgeon. He is, perhaps, only stunned by the blow, and does not fall down : he is sickened, faint, cold, and pale, but in a few minutes he feels quite recovered : often a blow apparently more terrible, is harmless : but whatever may be the force, there is unhappily no criterion of the effect of such a blow. Though a patient thus hurt is apparently well, and goes about his usual occupations, he feels a depression of spirits, and a confusion of head, a want of appetite, and loathing of food : he is in a faint, languid, and nervous condition : his hands tremble, and his head swims upon being hurried in exercise, or disturbed with any unusual emotion, and he passes the night in unquiet sleep, and terrifying dreams, from which he wakes in indescribable confusion, from time to time. In a few days, the part injured, though at first it was hardly livid, rises into a puffy tumour, round, soft, regular, circumscribed ; important, only as it is connected with these signs of danger, and as it implies a detachment of the dura mater, and contusion of the bone.

In a few days, the fever is more conspicuous, (though per-

haps the tumour is flattened) with slight horrors and shiverings; the confusion is more distressing, attended with pain, and a sense of girding in the head; he can no longer endure the light; the eyes are red, swollen and gummy; the pulse is quick and weak; the tongue foul; the skin parched; the visage pale and ghastly, with a hectic flush upon the cheek; the urine pale, and sparing in quantity; the hands, and the tongue, when he puts it out, tremble. He knows not what ails him, but is, night and day, in a state of indescribable confusion. During the night, roving, grinding the teeth, and slightly delirious; and during the day, desponding, oppressed and sick.

If the surgeon be fully aware of the import of these slight, but alarming signs, he opens this puffy tumour with the scalpel, and finds the bone dry, and whitish, or inclining to yellow. He knows by the aspect of the pores, which are the holes by which the arteries entered it, that it is dead. He applies the trepan, and upon taking out the piece, finds that there is a slight coating of cream-coloured pus upon the dura mater, and congratulates himself, not without reason, on having anticipated the danger, and saved his patient's life; for usually the symptoms subside after perforation, the dura mater reddens, granulates, and heals along with the scalp, with which it unites in one common cicatrix.\*

But, if the patient be regardless of these symptoms, unconscious of his situation, or indifferent to the intreaties of his surgeon; if any how this happy interval be neglected, the ulcer, which was in this stage confined to the dura mater, extends to the brain. The confusion of head, and fever increase: the patient becomes stupid, and drowsy, and awakes from sleep in great confusion and alarm. He has longer shiverings, and more continual sickness; his knees totter under him, his hands tremble, and his face is often slightly distorted with spasms; and his limbs, especially of one side, are often slightly convulsed; and growing gradually weaker, he sometimes becomes paralytic of one side, but usually becomes only more stupid, and oppressed, and suffers slight convulsive paroxysms before he dies. During the first eight or ten days, he is in this state of languor and sickness; from the tenth to the twentieth, he is in manifest danger; and usually before the twentieth or twenty-fifth day, he expires.

The nature of this puffy tumour, and the sad presages to be drawn from it, are now plain to you. The blow which contu-

\* Although the operation should certainly be performed under these circumstances, as giving the only chance for life, the surgeon should not be too sanguine as to the event. S.

ses the bone, deadens the scalp, and that surface which is next the cranium, is chiefly affected, in consequence of the hard resistance of the bone: the surface of the scalp, in contact with the contused scull, is gangrenous, and thence the tumour is emphyematous, soft, uninflamed: the deadened part being limited, gives a circular form to the tumour; by the extravasation of blood, and inflammatory thickening of the surrounding parts, it is circumscribed; and by its relation to the contusion of the bone, and the probable separation of the dura mater, such tumour becomes the most infallible sign of danger. Nor is it to be doubted, that such puffy tumour arises from the contusion of the bone, and the bruising of the scalp; for the separation of the dura mater will not cause it. Often have I seen the patient, who had great effusions of blood betwixt the scull and dura mater, lie for days or weeks oppressed and unassisted; but never have I seen such separation of the dura mater marked with puffy tumour.

“T. a big gross man, of about thirty years of age, was (upon I know not what quarrel, but I believe in defending a little boy who had been abused) knocked down with a brick bat. The fellow who had abused the boy, and then revenged himself upon the innocent man who interposed, was notorious for his savage dispositions, and for such uncommon bodily strength, as to leave no apology for his lifting any thing like a weapon. He lifted half a brick, and, standing on a stair to which he had retreated, threw the brick with all his force, and hit T. on the head a blow which felled him to the ground. He lay very long insensible, for the space of a day and a night, in his own house, so that had we seen him at this period, we might have apprehended some bursting of blood-vessels, and extravasation within; but he revived, recovered his senses entirely, found the cut on his head very trivial, and would have returned to his trade, but for that indescribable sickness and languor which hung about him, without any remarkable symptoms, to the hour of his death.

“Deep as the ulcer had penetrated into the brain, and early as the symptoms began in this man, they were all along very slight. He had hardly recovered from the insensibility, when the shiverings commenced. On the 3d day he had frequent fits of shivering, of a quarter of an hour’s duration, followed by heat and thirst. A purge (which I prescribed on the 4th) of jalap, and submuriate of mercury, operated smartly, and relieved the pains in his head. Next morning, I found the vertigo, head-achs, and tinnitus aurium, almost gone, and he felt nothing but a degree of weakness, and languor, and disturbed sleep. On the 6th day, I found this giddiness, languor, and



pain, increased, but again relieved on the 7th, by the operation of a second purge; and, on the 8th, he mentioned but slightly the pain of the head, and seemed chiefly distressed by the debility and languor. In this state did I watch him carefully, the headachs being relieved, but the languor increasing, till the 10th day, when, besides the oppression and languor, he felt sickness,—an increase of the headachs,—long-continued chillness and horrors,—a degree of confusion during the night; and he awakened, not as from a refreshing sleep, but oppressed in an unusual degree, with a hot skin, and fretful pulse; and he had that degree of constipation which I know not whether to ascribe, in such cases, to sudden confinement after a state of health, or to an incipient state of paralysis, which affects always, I observe, the viscera, before it sensibly affects the limbs. By a repetition of the purge, his confusion of head, and sickly feelings, were again abated, and something of cheerfulness and content was visible in his countenance. He remonstrated strongly against the cutting of his hair, under pretext of the ill effects which he had always experienced from cutting his hair, which infallibly, he said, produced headachs; but really, I believe, for fear of this being but a prelude (as it was indeed designed) to some operation.

“The small wound was now puffy and livid; the adjacent skin began to be undermined, and the probe, when introduced, ran along some extent of naked bone. The pulse had risen beyond a hundred, the tongue was white, the belly still costive, and the night of the 14th he passed in a sleepless perturbed state, succeeded in the morning with headach, a permanent sense of coldness, sensibility to light, and that character, in his features, and in all his motions, of oppression and extreme languor, which is inseparable from a suppurating brain. An uninformed person would expect suppuration of the brain to be marked by convulsions or delirium, while one at all acquainted with such scenes knows, that it is distinguished only by extreme weakness, not by the violence, but by the total absence of symptoms. The man knows not what ails him; the surgeon perceives his condition, but the patient hardly complains, unless it be of sighing, oppression, slight confusion of head, shivering, with a feeling of coldness at the accession of each febrile paroxysm, and trembling of the hands, and tottering of the knees, when either his mind is alarmed, or he endeavours to exert his strength.

“This man I had destined for the knife, conscious that no earthly power could save him, if that suppuration was allowed to come to maturity, which was plainly begun. But he was reserved for a different fate; for the natural course of rotation



of the hospital having delivered him into other hands, I met him wandering in the cold stairs of the hospital, his eyes indeed open, but his senses gone, at the moment he should have been under the operation of trepan. On the 13th day an incision had been made, so as to prolong the cut on his head, and expose the naked part of the skull, which was nearly on the top of the head, close by the sagittal suture. The bone was bare, and was known to be so for many days ; but it was not supposed dead. The incision healed, or seemed at least in a healing condition ; and for his sickness, effervescing draughts were prescribed. He continued, with slight variations of pulse, countenance, and intellect, in the same ailing condition, from the 13th to the 17th day ; but his vomiting was now severe ; his rigors lasted sometimes half an hour ; his complexion was wan ; his features contracted and pinched ; his eye heavy and melancholy ; his fever increased, and his pulse beating 112 ; and though generally feeble, it was sometimes very strong : even in the hour of visit, his vomiting was so incessant, his shiverings so violent, and his pulse at the same moment so weak and trembling, that it could not be felt. On the 18th, the confusion of head, the ringing of the ears, the fever and shiverings, and all the marks of disorder, were so much increased, that the operation could be no longer delayed, but unhappily, the man was, by eighteen days of suffering, reduced so very low, that the chance of his being saved by it was indeed very slight. Upon perforating the skull, a profusion of ripe pus flowed from the trepan-hole ; and he was committed to bed, where he passed an indifferent night. In the morning, though no shiverings were reported, he was chill ; and, in place of the oppressed and dejected countenance which he had before operation, his looks were wild, and his pulse extremely rapid.

“ On the second day after the operation, the dura mater looked black and sloughy, the discharge fetid, the matter continued to flow profusely from the trepan-hole ; yet his looks had changed again from wild and distracted to oppressed and anxious ; the shiverings, he said, had ceased, because he had refrained from cold drinks, but his head was sadly confused. On the 3d day he fell lower ; his senses were perfect, but his looks expressed unspeakable distress : the matter was brown, thin, and fetid, the wound dry and glazed, the skin hot, and the pulse feeble and quick, and the breathing oppressed : without having shiverings, he had frequent chillness ; with less feeling of pain in the head, he has a miserable feeling in every part of his body. By the 4th day, he had fallen extremely low ; the universal uneasiness seemed very distressing ; his pulse extremely weak ; his voice feeble ; his features shrunk ;

he never slept, but moaned and tossed continually. On the evening of the 5th day, after a severe shivering, he sweated profusely; his features shrunk perceptibly, his pulse was extremely quick, his extremities cold; the night was passed in great disorder; he struggled to get out of bed, and towards morning fell low, and expired."

The affidavit which I presented on this occasion to the magistrates, I have unfortunately lost. But in this case, I have given a faithful picture of a condition of the system which I have often observed and watched, from the slightest glimmerings of danger, to the last fatal struggle of delirium or convulsive tremors. By this instructive case, you are taught at once the slightness of the symptoms,—the danger inseparable from these phenomena of shiverings and puffy tumour combined,—the deadly suppuration that infallibly lurks under a dry and discoloured piece of cranium,—the folly of delaying, till deadened bone degenerates actually into black caries! and you are now conscious, that though the fate of the patient is terrible, the symptoms are not so: that the most deadly and decisive are, debility, anxiety, shiverings, and slight confusion of head: that to wait for symptoms is to wait for death, for the first slight convulsion, or decided delirium, is the immediate forerunner of death.

The case I am now about to lay before you, is of a very different complexion. "Elizabeth Barrow, a woman of the most dissolute life and manners, about thirty years of age, was knocked down in the dark, in a drunken tumult, with a candlestick, poker, or some such weapon, but immediately recovered her senses, and continued in health.

"The blow she had received was near the vertex, upon the corner of the parietal bone, and not far from the sagittal suture; and there rose over the contused part a circular tumour, not exactly a puffy tumour, but rather aneurismal, containing blood. For six weeks the tumour was stationary, and the woman, though weakly, and having pains in the head, was without any formal complaint. Perhaps there is no greater mark of a dissolute life, and vicious dispositions, than a disregard of health; and this woman ran her usual course of vice and wickedness, undisturbed with any thoughts concerning her health, till febrile paroxysms and pains of the head forced her to apply to a surgeon, who opened the tumour, which was then of the size of a hen's egg, with the point of a lancet, and it discharged chiefly blood. But the puncture soon closed, matter gradually collected, and the tumour was soon of its original size. In a month more, it was again opened, and discharged blood mixed with matter, healed again, and again formed.

“The tumour was pointed, and about half the size of a tennis-ball, soft, puffy, and little elastic. The centre soft and fluctuating, the circumference hard, firm, and bulging; the bottom solid, and giving that very peculiar feeling, by which we are apt to be deceived, in recent extravasations of blood; it felt as if the tumour covered a very remarkable depression of the skull. Upon laying it open with free incisions, the matter which flowed was thick and purulent, much mixed with blood; one of the arteries of the scalp bled profusely; the bone was felt rough and scabrous to a great extent, and from part of its surface a loose fungous growth, so loose that you could push the point of your finger through it, protruded into the cavity of the abscess. In these circumstances, how to proceed was indeed a question of delicacy. In a recent contusion, with even the slightest of these symptoms, where there was, with occasional shiverings, a naked bone at the bottom of a puffy abscess, the rule would have been express. But this woman was in apparent health; much time had elapsed without any signs of danger; the bone might be carious merely on its external surface, and might exfoliate, or might granulate, (as indeed it did in the end granulate): There could be no apology for precipitate operation; there seemed to be time for reflection; the perforation of the cranium was accordingly deferred.

“But she had been induced to present herself to the surgeons, from having headaches, sometimes severe, with confusion of head, chilliness, and fever-fits, which were very distressing; she was at the same time so nervous and alarmed, and her sufferings altogether so great, that she received with pleasure the first proposal of an operation. The catamenia, which had disappeared after the blow, were now flowing, but were suddenly stopped with an increase of headach, a costive belly, a hot skin, and a febrile pulse, counting always above 100. On the 4th day of putting herself under our care, the incisions being already very free, the operation of trepan was performed by Mr. Lawson, who made his perforation near the sagittal suture, and on the anterior part of the caries, through a very unusual thickness of bone: but the bone was in part alive; a great profusion of blood flowed from the cancelli; and the moment the inner table was divided, and before the perforation was complete, matter spouted up in great profusion by the sides of the saw.

“The night following the operation, the patient was restless and feverish, for, upon opening an abscess within the skull, as in opening one in any part of the body, the fever and nervous symptoms, hardly perceptible before, became very conspicuous. Though the wound looked well, the head was in confusion, and



she became extremely sensible to noise or light. The succeeding night was calm; and the headach; which was violent the first day, was relieved by rest and quietness on the second. The flow of matter from the surface of the dura mater was good and copious, and its surface began to granulate.

"Even on the 5th, I found her complaining of great depression of spirits, nausea, and sickness, and great pain of the head; but, by the prudent use of clysters of opiates, and a little wine dashed with water, the sickness abated in two days, the wound contracted apace, the pus was thick and well-formed, the surface of the dura mater was florid and granulating. By the 8th day, the margins of the trepan-hole were red and fleshy, and the whole surface of the diseased skull was covered with a rich pile of granulations. In about twenty days more, the wound was contracted; the cicatrix of the skull, scalp, and dura mater, consolidated; and the woman perfectly cured in six weeks."\*

Without any suggestion on my part, you will reap every advantage from the contrasting of this with the preceding case, and learn by experience the duty of watching with extreme solicitude the slightest changes of the eye, countenance, or pulse; the slightest shiverings, oppression, or sickness, in those who have this contusion of the skull.

In cases of fracture, there may, indeed, be doubts as to the propriety of operating: the danger is eventual, the operation merely preventative. Fracture may cause a suppuration of the brain and membranes at some future period; but contusion is the disease itself, it is the actual suppuration of the brain, announced by infallible signs. Of all the cases in surgery, this is the least equivocal. Of those who have fractures of the skull, many even in the most alarming circumstances survive unassisted; but in contusion, followed by suppuration, unless the skull be perforated, unless the abscess be opened, all must die.

O'Halloran says a thing at once untrue and discouraging; untrue at least as a general aphorism, and discouraging, since it tends to make us indifferent to the most interesting question in practice, and to the condition of many who might be saved: "In the course" (says O'Halloran) "of many years practice and careful observation, I cannot give myself credit for a single cure I ever performed in this way, (by trepanning) *when the symptoms of deposit were formed; for whether the patient*

\* This woman, who made no secret of her vicious life, or syphilitic taints, had a new suppuration over the trepanned part of the skull nine months after the operation; the abscess was opened; a scale of bone exfoliated; and she had a mercurial course administered to her for the cure of very suspicious pains, accompanied with slight nodes on the clavicle and sternum.



*was or was not trepanned, the scene closed with death.*" This does but prove the culpable delays, even of this good practical surgeon, forewarned as he was of the dangers of matter being formed; and demonstrates to us, that those who die are lost by temporising and timid counsel.\*

Pott, our celebrated surgeon, whose opinions and writings are so justly esteemed, was engaged in that tumult of practice, which left him little time to frame general laws; yet he could not fail to act with good sense and skill in each individual case: he was sure to practise right, but in danger of teaching wrong, or at least imperfectly: his opinions want but one short explanation, for they are such as will never be disputed, where they are understood.

"For my own part, (says Pott) I have no doubt, that, although by establishing it as a general rule to perforate in all cases, some few would now and then be subjected to the operation, who might have done very well without it; yet, by the same practice, many a valuable life would be preserved, which must be inevitably lost without it, there being no degree of comparison between the good to be derived from it, when used *early as a preventative*; and what may be expected, if it be deferred till an inflammation of the dura mater, and a symptomatic fever, make it necessary."

A preventative! How could the operation of trepan prevent inflammation of the dura mater? Could perforating the skull with a saw, tearing up the vessels which naturally connect it with the dura mater, and exposing that membrane to rude dressings, and the touch of instruments, prevent inflammation? Yes, surely: it could prevent all the dangerous consequences of inflammation: it could prevent matter accumulating, and inflammation spreading: it could prevent ulceration penetrating to the brain: it could convert an extending and most dangerous abscess into an open sore: it could enable the dura mater to granulate and unite with the integuments. There is no good purpose that a timely operation might not serve; and if

\* The opinion of Archigenes, as cited by Mr. Bell, is probably correct:—"When the dura mater is inflamed, then come shiverings, and fever, and flushings of the face quite disproportioned to the degree of fever; disturbed sleep, eyes heavy and swelled, a sore flabby and foul with ill-digested pus; sometimes pustules cover the tongue. *Those who are speedily assisted have some chance of safety; but when help is but a little delayed, they almost always die.*" Whenever symptoms of inflammation of the brain, or its membranes, take place, if there be a puffy tumour, and no wound of the integuments, they should be immediately laid open down to the bone. The head should be shaved, and a blister applied over the whole of it, except immediately upon the wound. Bleeding and purging must likewise be very copiously used, and the strictest abstinence observed, in order, if possible, to prevent the formation of matter, for should this happen, no subsequent treatment will probably save the patient. S.

the trepan be used only when it should, there can be no vessels torn ; nor will the dura mater be exposed, for the dura mater is previously in a state of suppuration, and separated from the inner surface of the skull. We find, by his examples, that Pott meant, by prevention, the anticipation of worse symptoms, the preventing of death ; that he regarded the operation as preventative, when it was used so early, that though the dura mater had previously suppurated, the suppuration was but slight ; when, by the timely opening of such abscess, it was prevented reaching the brain, when the dura mater granulated easily, and healed naturally. Unless we were to take an ungenerous advantage of a slight inaccuracy of language, and dispute the words of this author, while we understand his sense, we must acquiesce in the principles he has laid down, and give him honour and praise, for the comprehensive and judicious views he has taken of what he saw going on around him, for the honest and manly boldness with which he has declared his principles, so different from those transmitted to us by the writers of the preceding age, and for the generous manner in which he has taken upon himself a responsibility of the most critical nature, resisting alone all that torrent of reproach which was likely for a time, and especially in his own day, to be attached to what may be termed Hospital Practice, harsh and cruel surgery. But study his cases, and you will perceive, that whenever Pott trepanned, the patient was in danger, the bone bare, the tumour puffy, or the wound (if there was one) fetid, the pulse quickened, the face flushed, the head in confusion, and the fatal shiverings begun ; and these are marks, not of future danger, but of actual suppuration. It is fortunate for mankind, when new doctrines are not extravagant ; when those who enjoy the public favour, have won it, not by the capricious and captivating effusions of genius, but by the lasting attraction of sober inquiry and sterling sense ; when a popular work contains principles which, being founded on experience, will stand the test of time.

## DISCOURSE XIX.

## OF FRACTURES OF THE SCULL.

## SECTION I.

*Preliminary Observations.*

THE old surgeons allowed not the slightest chink, fissure, or rima, as they called it, to escape investigation; the slightest fissure, or the bare suspicion of one, was the signal for applying the trepan, and there was nothing so gratifying to them as a fracture so circumstanced, or an extravasation so extensive as to require, or at least to vindicate, the application of the trepan ten or twelve times. It was not that the crown of their instrument was small, and thence its application, necessarily frequent, to make even a moderate opening; they scrupled not, after making numerous perforations, to cut up all the intermediate pieces of bone with the saw, and clear away a whole parietal bone, or half the scull. This was the pomp and pride of surgery in former times, which you are called upon to imitate, by the approbation with which such facts are now commemorated, and by the very form of instruments put into your hands, which are by no means calculated to make very moderate openings: the making very large openings, either by large trepans or frequent perforations, is a practice highly commended in every book, and the extent of the fracture is usually reckoned the sole limits of the opening.

“In excessive fractures (says Dionis) we should not hesitate to make two, three, or four perforations, if required. A young girl, of eleven or twelve years of age, having, by a fall down stairs, fractured the whole of the parietal with a part of the temporal bone, Mr. Marechal trepanned her next day in two places: he made his son trepan her a third time; he

allowed my son, who was present, to trepan her a fourth time: the nex day, applied the trepan twice more, and in the end had actually perforated twelve times, and cured her completely. So precious an example shows how little reason we have to be surprised at the frequent application of the trepan." Here is a doctrine laid down, which, I fear, there is little occasion to enforce; and I cannot but persist in being surprised and shocked, at the frequent and large perforations which I have both read of and seen, and cannot but think of these veterans in surgery in no very amiable light, when I see them indulging their boys in the novelty of operating, probably on very slight compulsion.

These reports, and especially the last clause of this paragraph, viz. "that we should not be surprised at the number of trepans," have plainly a reference to the ever memorable operation performed in the time of King William's wars, on Philip Count of Nassau, by Henry Chadborn, chirurgeon. Godifredus, chief surgeon to the States of Holland, mentions with particular exultation this operation performed by his friend, who trepanned the cranium of the Count of Nassau twenty-seven times, and ascertained the fact by the most indisputable authority, for he made the said Duke of Nassau, after he was recovered, on the 12th day of August, 1664, write the following curious certificate. "I the under written Philip Count Nassau, hereby declare and testify that Mr. Henry Chadborn did trepan me in the skull twenty-seven times, and after that did cure me well and soundly."

Mr. Pott, a surgeon of unrivalled excellence, whose influence was fairly acquired, (but let those who have influence with their profession use it discreetly and wisely, let them ponder well the maxims they announce) fell into a system of practice so bloody and enterprising, that, in the few years which have elapsed from his death, it has fallen into utter discredit, and he delivered his maxims in a style so decisive and imperative as to impose even now upon the younger part of the profession, while, by all who judge for themselves, his practice is abandoned:\* no wonder it is abandoned, being, in every point, except one, repugnant to good principles. He, in every case, whether slight or dangerous, *cuts off the whole puffy tumour*, scalping the part with

\* In the accounts which we have of the former practice in France, it is related that surgeons made numerous perforations along the whole track of a fracture of the cranium; and, as far as I am able to judge, without any very clear design. Mr. Pott also advises such an operation, with a view to prevent the inflammation and suppuration of the dura mater, which he so much apprehended. But many cases have occurred of late, where, even in fractures with depression, the patients have done well without an operation. *Abernethy's Essays.*



a circular incision: he, in every suppuration of the dura mater, and in every case of extravasated blood, *applies the largest trepan*, though he has no other purpose than to give vent to such matter or blood: dissatisfied (as he had reason to be) with the small trepans in common use, he ordered them to be forged for him of an unusual size, and did not spare their liberal application. After perforating the skull once, in place of providing by other means for the free evacuation of the matter, he applied his trepan again and again, till all the suppurated surface of the dura mater was displayed, declaring it to be his intention to cut away all that part of the skull, however extensive, under which the suppuration existed.

“When the operation, says Mr. Pott, has been performed, not as a preventative, but to give discharge to matter, the only chance of relief is from laying bare a large portion of the dura mater, that the discharge may be as free, and the confinement as little as possible, as nothing but this can do good.” And again he says, “Yet perforation is absolutely necessary, in seven cases out of ten of *simple undepressed fracture of the skull*.” He does by no means deliver these rules with temperance or modesty, but says, “I am as well satisfied of this as of any truth which repeated *experience* may have taught me.”

Such bold words lose all power when we begin to find how ill experience may teach a man, and how unreflectingly such language is used. At first, the reader would naturally say within himself, “Surely Mr. Pott, before he could use such confident language, must have seen repeated and afflicting proofs of the necessity of using the trepan:” but to his utter confusion, he finds the very words repeated in commending the now obsolete operation of scalping, and, indeed, on every occasion, trivial or important, for it is with this author, a manner, and no more: He says, “The way of doing this, (*viz.* of scalping) has formerly been the occasion of much difference of opinion; but THERE CAN BE NO DOUBT *about the greater propriety of removing a piece of scalp for this purpose, by an incision in a circular form!*” Even when Mr. Pott applied the trepan, not on account of any present, but of some eventual, perhaps imaginary danger, he set no limits to the number of perforations, but the extent of the fracture. He says, “If the trepan be applied in a preventative sense merely, *the length of the fracture must determine the number!* one or two only may be made at first.” In short, all his precepts, most of his cases, and even the very form and size of his instruments, contributed to renew and strengthen that passion for frequent perforations and large openings of the cranium, which the decline of false learning and the progress of plain good sense had almost allayed: and I will ven-

ture to say, that whoever has studied his writings, or imbibed his principles, must imagine that, in the work of trepanning, he can never do too much, and is only blameable where he has left any possible thing undone. But a few men of strong natural sense, among whom Platner is one, have had the sense and courage to protest against such frequent applications of the trepan. "There is by no means any necessity (says Platner) to have recourse, in all cases of fissure or fracture of the skull, to instruments to cut them out with: where there are no evil signs, the trepan is not required:" but unhappily the most extravagant and foolish things are best remembered, and oftenest repeated, while these solid remarks of a man of skill and judgment are but too easily forgotten.

We find that it had been the practice of the older surgeons not only to apply their trepans the whole length of a longitudinal fracture, but along each of the radii of a star-like fracture, and in short, to repeat the expression of Platner, 'to cut it out.' The testimonies of the most sensible writers are against the operation, and most unfavourable to the men who have indulged it, for it has been ascribed not to reason, but to pride. "If the opening (says Wiseman) in the fractured skull be not sufficient, make one in the most declining part, and raise up the bones, and free the membrane of whatever may offend it, but *do not take out any more bone than needs must*, like some of those surgeons I have met carrying them about in their pockets, *BOASTING IN THAT WHICH WAS THEIR SHAME.*" Never is the apology wanting to those who are proud of making numerous perforations: if they do not find a conspicuous depression, or a great length of fracture, they affect to be seeking for pus, or that they are anxious to let out extravasated blood. They dare not forsooth, after making the necessary opening, allow the pus to ooze out gradually, or the blood to melt down and be resolved into serum. They affirm, "that it is infinitely more dangerous to wait the dissolution of the coagulated blood than to make numerous perforations for the evacuation of such pernicious juices, for not only such openings as that we have just mentioned of 12 trepans, but openings much more extensive, close easily." "I have seen surgeons, says Ravaton, so infatuated, so desperately bent on discovering abscess on the dura mater, that, after applying six crowns of the trepan, they would, I verily believe, have pulled away all the remaining bones of the cranium, had not their patients been delivered by death from such operations." In short, their doctrines and practice outraged common sense: every thing was to be done by the surgeon, nothing left to nature: every depression was to be elevated; the whole matter to be evacuated; the whole ex-

tent of the extravasation to be covered by trepan-holes, and the limbs and whole extent of a radiated fracture were to be cut away. There were no limits assigned for these openings, but the extent of the extravasation or fracture, and they were well contented to find that 40 crowns of the trepan might upon necessity be applied to the human skull.

But there is a scene of practice very different from this, where men, engaged in the actual duties of the profession, in peace or in war, in cities or in the field, learn to look coolly on wounds of every description, and know from experience what nature will do, and how impertinent and vain those operations are. It often happens to grooms or farriers, trimming horses feet with too little precaution, that the horse striking out, they receive the kick full in the forehead: the scalp is torn up, the skull manifestly injured, or not a little depressed; these men live a coarse irregular life, and yet such fractures heal easily, but, were the trepan applied on every such occasion, we should have many dismal scenes. It often happens that boys playing with horses, plucking hairs from a colt's tail, for example, are knocked down by a kick in the forehead; often the bone is deeply depressed, very often the marks of the heels or caukers of the shoe are impressed upon the *os frontis*; sometimes a piece of the bone is actually turned upwards along with the scalp; but the scalp being re-applied to the skull, the splinters of the bone picked away, and the ragged integuments smoothed and secured with stitches, the boy, without one hour of sickness, recovers as if his wound were only of the skin. But were such pieces of depressed or shattered bone cut out; were openings made at all proportioned to the depressions, or to the extent of the fractures; were the delicate *dura mater* of a boy left exposed to that force of circulation, which dilates the brain, and fretted by every stroke of the arteries against the margins of the opening, the *dura mater* would slough, perhaps, the brain protrude and suppurate, and the boy expire howling and convulsed. Examples of such imprudence and such consequence I shall presently relate, for I know, that when my business is to impress you with any practical truth, the best way of confirming the maxim, and making you feel the force of it, is plainly to represent the scene.

Often the recovery, where the skull is very deeply wounded, is so rapid, as to surprise those even who are the most resolute in refraining from the use of the trepan, and the best prepared to expect a happy issue. The faith and credit of Pareus stand unimpeached; and the case he relates, of a cure performed with his own hand, is the most remarkable of any yet recorded; since even the segment of the skull itself in a clean sabre-wound, adhered again in common with the wounded scalp. "I advise



(says Pareus) wherever there remains a portion of the skin still connected with the wounded scalp, that neither that skin, nor the divided portion of bone be cut away, but the bone sewed up along with the skin. What Celsus commends (says Pareus) I performed in the case of Captain Hydron, who was a short while ago wounded in this city with a sword through the centre of the os frontis, the bone being cut down the length of three inches, so that it hung over his face, connected with the skull only by its pericranium, and about three inches of the fleshy scalp. At first sight, I questioned whether or not I should complete the separation of this piece of skin with its adhering bone, but remembering Hippocrates's maxim never to uncover the brain, I cleansed the blood, which was upon the dura mater, laid up the separated piece, and, for the better retention thereof, made three points of the needle in the upper part, and put in three small dossils in the sides of the wound, the whole being so nicely replaced, that, by God's grace, it healed perfectly, though the gentleman was otherwise much wounded on the face, in the thigh, and in the right breast. I finally beseech you (says Pareus) never to amputate neither skin nor bone, lest the brain should be left bare."

In the work of Berengarius, *De Fracturis Cranii*, so much and justly praised, you have no instructions for discovering, nor any warrant for trepanning fissures. He seems to have been taught a very different practice by his father in his earliest years. They seem, in these times, always to have felt a sort of trepidation when they sewed the scalp; and Berengarius gives many anxious directions about undoing the stitches upon the slightest appearance of fever or abscess; but still he directs that the scalp be sewed.

Especially when the bone was wounded, they feared to sew the integuments; yet Berengarius, while he complies with the rule, relates an exception highly worthy of notice. He reminds his reader that he had advised the suture of the scalp only when the bone was unhurt and the pericranium entire; "for a suture (says Berengarius) being drawn close over a diseased bone, the patient dies, wherefore, such wound must be dilated and opened, not sewed and closed: Yet, I call God to witness the truth of the following narrative, so unprecedented that I dare hardly tell what I saw. While I was a young man, a soldier wounded his fellow with a weapon, and cut down the os frontis from its upper part to the superciliary ridge, so that the os frontis, with its integuments, hung over his eyes, divided from above and at the sides, and connected only below. My father went first to his assistance, and removed the bone from the integuments; the bone was the whole length of the os frontis;



the dura mater was untouched. The skin of the forehead was replaced and stitched without that opening at the lower part of the wound which surgeons are accustomed to leave as a drain for the matter; being closed with white of eggs, and dressed daily, it was in ten days completely re-united, and ever after the systole and diastole of the arteries was distinctly seen where the bone was wanting. This I have put down, says Berengarius, to make medical men keen and courageous in curing wounds."

Besides these instances in domestic life, it is remarked, to the dishonour of our trade, that in times of war and trouble, when men are not allowed to take care of their wounds, those who are least cared for are soonest cured; and a man, who is forced to wrap a clout about his head and ride for his life, is safer than one who is chambered up, dieted, and dressed, perhaps trepanned by the surgeon. The great rebellion was full of such adventures and hair-breadth escapes, many of which are related by Wiseman: among others, that of "a gentleman who, a day or two before the battle of Worcester, attending the Earl of Derby in his retreat thither, received a large wound between the sagittal and coronal sutures by a sword, which went through the cranium to the dura mater, is exceedingly remarkable: the membrane was covered with small shivers of bones: he had only a thin linen cap over it, his haste not permitting him to be dressed, and it may be it was the better for him, for if dossils had been hastily crowded upon the bones, severe symptoms would have followed; whereas the shivers lying lightly upon the membrane, he was free; and being ignorant of his danger, rid a great journey: I after took them out, and dressed the membrane with digestives, the short time we were together." It was upon such proofs that Wiseman came to be persuaded of this general truth, that "RECENT FRACTURES OF THE CRANIUM DO FREQUENTLY UNITE LIKE THOSE IN OTHER PARTS, if the matter hath liberty to discharge from within. Therefore having raised up the bones that are loose, dress the others dry."\*

"During the war," (says Wiseman) "I was frequently employed in the dressing of some one person or other, wherein I have seen all or most of the several sorts of fractures. I have dressed many that have been cut through the skull, *the shivers of the bone lying pushed with the flesh and the hair, upon the dura mater*; yet the patient hath had no symptom of such a wound." Here, in a few sterling words, are descriptions which will better satisfy all your doubts than the most learned arguments.

\* Wiseman, page 113. vol. ii.

So much for open wounds, when the clean incision of a weapon seems to have done the business of the trepan. But, even in cases where the bone is fractured with a wide and portentous fracture, or when it is actually depressed in a way which might vindicate the application of the trepan; in cases where it requires some courage to refrain from operating, the patient is cured with surprising ease. I can be at no loss in proving this in a thousand various forms; if I could feel any difficulty, it must be only in selecting the cases which best represent the variety of circumstances. In Mr. O'Halloran's paper in the Irish Transactions, we find, among other cases, that of Edward Power, "who received a desperate wound of a back-sword, extending from the top of the coronal bone to the orbit of the left side, forming *an extended and frightful chasm*, in which were included *the bone, membranes, and brain*. It bled considerably, as may be well supposed. He remained exposed to the air for near three hours after, and had not so much as a bit of rag to cover it: fever and inflammation of the brain might reasonably be apprehended; yet, by a couple of bleedings, and some other antiphlogistics, the man was completely cured in five weeks, without exfoliation or the smallest operation."

On one point you may naturally feel some hesitation: You see that clean wounds, as when a trooper is cut to the skull with a sabre, are not, (even when the skull is fractured, or part of it sliced away) attended with that danger which was once supposed; but fracture of the skull produced by a heavy blow, where the bones are broken, perhaps depressed, may be, nay, must be, an injury of quite a different nature. You are not only to refrain from trepanning fissures, in the absence of dangerous symptoms, but, if I may advise you, even fractures very wide and gaping. "John Smith," (says Mr. Hill in his Book of Cases) "when forty years of age, had several inches of the scalp torn off by the kick of a horse, and some of the hair was beaten inwards through a long fracture of the skull, which was so wide that there was no occasion for the trepan. He recovered in a few weeks, and is well." Why does Mr. Hill announce this fact in such abrupt familiar terms, but because he well knew that this was no unusual accident, that he had often seen such fractures of the skull spontaneously cured?

Even deep depressions and very irregular fractures heal, and, what is more rarely to be found, are permitted sometimes to heal, undisturbed. The case of James M'Cartney, a boy of between five and six years of age, is of this nature: "He had a large piece of the parietal bone driven deep in by a stone. A few days after he was stupid, doting, starting, and vomiting: there was a large tumour and obscure fluctuation on the depres-

sion, owing to some ounces of blood below the pericranium; on piercing of which, it sprung out to about a foot's distance. The incision was continued across the depression and fissures: to prevent such exfoliations as often happen, the scalp was *instantly laid close down again*, with soft dossils only in the wound to keep it open. As no bad symptoms intervened, the fissures being wide enough to allow a passage from within the skull, nothing farther was done but lessening the dossils gradually, till it healed, which happened in a short time, without exfoliation. The hollow is considerable, and will continue for life.\* He is in good health, and at sea.

You will naturally say, What then should we infer from these cases? Are we to do nothing in fractures of the skull? Are the instruments hitherto appropriated to fractures of the skull to be thrown aside? The trepan is not the instrument appropriated to fractures of the skull, but that with which we perforate the bone, when either fracture or any other kind of occasion requires such opening; and of all the motives for using it, that of fracture of the skull is the least frequent: you perforate the skull to let out extravasated blood, which oppresses the brain, to open abscesses which could never force its way through such resistance, to raise depression, if you will, but never on account merely of fracture. Allow yourselves but to consider in what fracture of the skull differs from that of any other bone: not in want of circulation in the skull, you have every proof that its circulation is lively and perfect, since the dura mater is detached, the pericranium scraped off, the bone itself bent from its right direction, sometimes raised up, sometimes depressed,\* and yet it does not die: you see the integuments coarsely torn off with a stone or a carriage-wheel; you see the skull rough, yellow, and apparently void of circulation; you see every threatening appearance of caries, and would believe it dead: often the wound seems as if a part or the whole would exfoliate, yet in a few days all the naked part of the bone begins to look red; a fine velvet-like down of vivid granulations begins to appear in spots and clouds upon the bone; sometimes these granulations are, out of mere wantonness and ignorance, scraped off, but they instantly sprout out again: what becomes of the rima fissure, or fracture, is never observed; it is covered in by this pile of granulation spreading slowly over the bone, and uniting it with the integuments. This process I have seen with admiration, where I could least expect it to take place; in old creatures of ninety years of age, very poor and miserable, and in whom, along with fracture, the integuments had been so man-

\* Hill's Cases, p. 117.



gled as to slough off in flakes. It is just such a delicate pile of granulations that covers the surface of the dura mater, when it appears after the operation through the trepan hole, uniting the dura mater with the integuments and with the margins of the perforation. Those who affirm that there is no danger in trepan, affirm of course that there is none in fracture of the skull, for the perforation and the fracture heal by one process, and with an equal pace. If this, which I have observed many times, be the regular and natural process of healing both in the trepanned and in the fractured skull, what apology have we for perforating the skull, and tearing with levers all those parts we think suspicious, or perceive to be depressed?

The motives assigned for making large and frequent openings are, in case of simple fracture, to prevent danger; in case of depressed fracture, to raise up the depression; in case of extravasation or abscess, to let out the blood and matter freely. But, are not the smallest openings we can make sufficient to give vent to any suppuration, as the smallest puncture is sufficient for the cure of the largest abscess in any other part? Is it possible, would it be prudent in any case to lay open all that part of the skull under which blood is effused? Though you were to work with your trepan as industriously and unconcernedly as a button-maker, or to trepan as this Henry Chadborn did twenty-seven times, you still would never get to the end of your operation, if the extent of the extravasation were its only limits; I have rarely seen a case of extravasation where the cake of blood did not extend over one entire hemisphere! under a whole parietal bone, and generally down to the basis of the skull, nor an abscess, but where much of the surface of the dura mater was coated with pus: I have never had the good fortune to perform or assist at any operation in which it was possible, had we been so extravagant as to design it, to expose the whole coagulum of blood by perforations: in short, what I have observed, is this: that, where, in the case of abscess, we are fortunate enough to be alarmed early, one perforation gives vent to the pus as well, to my apprehension, as fifty: the matter bubbles out at each systaltic motion or heaving of the brain; nothing prevents it but that fungus or protrusion of the brain, which so frequently happens when the openings are large. That I may almost assure you that, where the openings are made large, they never continue long free, but are plugged up by protusion of the brain. In the case of extravasation, which has no certain limits, I have always been sensible of the folly of trying to lay it all open, for then the limits of our operation could only be limits of the skull: but after one perforation, when, by the heaving of the brain, the clots have rolled out of the trepan-hole, as thick and black



as pitch, there succeeds a more fluid blood, the patient often finds instant relief, moves his paralytic side, raises his eyes, and though, without being able to speak, knows his friends ; from day to day, the blood by the natural process of its dissolution, and by a sort of secretion from the surface of the dura mater, is diluted and flows out. The introduction of the probe, often to the extent of six inches in every direction, proves how vain it were to attempt laying open the whole extravasation : the deep introduction of the probe has probably suggested that practice, which is mentioned in books, of making a second and far distant perforation as a counter-opening, but which I cannot approve because I have never seen it necessary : the probe bent and surrounded with a little lint, or a long hair-pencil, is very useful in hooking out the clots, and an injection of tepid milk washes them away. While the coagulum is thus resolving, the dura mater is suppurating and cleansing on its surface ; it is at last seen through the trepan hole of a lively red, granulating and bleeding upon the slightest touch : then it comes into close contact with the lower surface of the skull, protrudes with gentle convexity through the trepan hole : the granulations of the integuments, skull, and dura mater gradually adhere, till the whole becomes one undistinguished granulated surface, where bone cannot be distinguished from flesh. This is the state of matters, (with occasional interruptions and variations) in the third week, and thus the opening closes and heals. I have often found it necessary, from the strong protrusion of the dura mater into the trepan circle, if not through it, to repress the dura mater at each dressing with the probe wrapt in lint, in order to give exit to the matter or blood.\*

This I can most safely affirm, that wherever I have seen cases of fracture, whether simple or depressed, committed not injudiciously nor carelessly to nature, they have done well. Wherever I have found the surgeon impatient to perforate, intent on raising every depressed part of the skull, careful to include in the circle of his saw every suspected piece of bone, and anxious to secure a free evacuation of matter by large openings ; I have seen such tearing up of the skull, especially in boys, as I could not witness without pain, uniformly followed by protusions of the brain, and death. In no other part of the body do you open abscess, or discharge extravasated blood by large openings ; is the brain the only part to be thus roughly treated

\* In the circumstances here described, some physicians have ordered counter-openings, others have used leaden canulas, grooved or guttered probes, &c. to conduct the matter or blood from under the cranium : I have never found these necessary.

and exposed to the air, to dressings, and to every thing that is supposed to injure it?

Are we then to do nothing in fracture of the skull?—Nothing I believe which you should not do in fracture of any other bone of the body. Pick away the fragments of bone, lay the edges of the lacerated scalp quietly and smoothly together, stitch them that they may lie in that nice contact which is necessary to procure adhesion, but not tight lest they inflame:\* lay all smooth, nice, and close, dressing the wound daily and lightly that it may adhere, which often it does to a miracle, the dura mater, trepanned circle, and crushed bones and integuments, all consolidating in one firm scar: preserve the patient carefully from every irregularity or excess that might cause inflammation; keeping him quiet, cool, low in diet, and without wine. Be assured that the experience of a Wiseman, and the good sense of Platner are not to be despised; remember what Platner affirms, “if there are no bad symptoms, there is no occasion for the trepan.” Adhere to this general maxim announced from such high authority, and it shall be my care to explain every exception so fully as to prevent you, while you avoid the fault of hurry and impatience, running into any fatal error from neglect. You see with what perfect confidence these celebrated men dressed up a fracture, and committed the case to nature, while men of less experience or knowledge would have been busily occupied in scraping every limb of the fracture, and in applying the trepan to each. But they were emboldened by the best of all teachers, experience, to act thus: and whatever prejudices in favour of operating you may carry with you from school, to this opinion must you return at last. I can safely declare along with O’Haloran that, “in cases of fractures of the skull, long experience has convinced me that many of them require no operation.” If there be any exceptions to this rule, it must be when the fracture is accompanied with depression.

## SECTION II.

### *Of Fractures of the Skull with Depression.*

I must seem then to have admitted that “depression of the skull oppresses the brain, and requires to be raised up with le-

\* In such cases I would not attempt completely to re-unite the integuments, because should they adhere, it will be frequently necessary to open them to let out matter. Interpose a small piece of lint between the edges of the scalp, so as to prevent a complete re-union, and as soon as all danger of bad symptoms is vanished, it can be healed in a few days. S.

ver, or cut out with the trephine:" Yet there is no general conclusion I should more unwillingly allow: I should be inclined rather to reject the general rule than to qualify it with so many perplexing exceptions as it would in my judgment require: There are many depressions so fixed that no force of instruments could raise them; so extensive, that to cut them out, or loosen and pull away each fragment of bone, would be to open half the cranium, and expose the brain to protusion, on account of imaginary dangers. Depressions seem many times so alarming to the surgeon, that to raise them, or cut them out, he will use the most unjustifiable violence; yet, though he fails, and the depression remains, the patient, notwithstanding this additional violence, survives: and many times the depression, which has been the subject of such unjustifiable violence, though very conspicuous while the surgeon is labouring to raise it, is really so slight as to be invisible before the wound is closed.

The striving to elevate depressions of the skull, while the patient, far from having any oppression of the brain, is crying with torture, struggling and resisting, though it has been long esteemed the most meritorious work in surgery, is extremely censurable, and has, to my certain conviction, brought many a patient to an untimely grave. "I shall now (says O'Halloran) remark on such fractures as necessarily require the operation in the *first instance*: these are fractures accompanied with depression, with or without wounds: for, not to advert to the *restraint* such pressure must necessarily cause to the brain, *sufficient in itself to produce fatal effects, &c.*" This is affirming, in its utmost latitude, that very mistake on which all the bloody doings of past and present ages are to be attributed. "If a single operation (says Warner) be insufficient, (as I have often known it to be) to effect the elevation of the depressed bone, a second and a third must be performed, that the surgeon may be enabled to *raise up every part of the depressed bone*; which *rule must be strictly observed*, otherwise the operation cannot be expected to be attended with success, as the *bad effects of the oppressed brain* must remain." In every elementary book you read the same language, and from every lecturer hear the same general conclusion; for, in describing the skull, he assigns depression of it and its fractured part intruding upon the brain, as the principal occasion for using the trepan.

This passion for leaving nothing undone will naturally glide into your minds; for the prejudice of every profession is in favour of what its art can accomplish, and in ours, this bias is peculiarly strong: trepanning fractures, raising depressions, and making ample openings for blood or matter, are the surgeon's



chief pride. But I cannot help recollecting the droll expression of Permanmus, who says, or his translator for him, "there are many persons who fondly imagine that boring a hole in the skull is an easy matter, and to be done at any time, whereas it requires *mature consideration*, a very *able head*, and a skilful hand to undertake it."

Aware of the deceptions to which you are exposed, I should feel myself much to blame did I neglect to warn you of them. You will say within yourselves, "though it is plainly our duty, and is most natural, to leave a mere incision or wound, although it affect the skull itself, untouched and but lightly dressed, since we know that wounded bone will re-unite with the soft scalp; though it be equally natural and right to treat a compound fracture of the cranium, even where it is much shattered, like a compound fracture of a limb, by picking away the loose bones, cleansing the wound, composing the soft parts, and laying all smooth and close; is it equally natural or proper to leave unreduced a depressed portion of the cranium, which cannot but press upon the brain?" "Surely, (you would say), the visible depression of a piece of the skull must be an oppression to the sensorium, of the worst and most dangerous nature, because it is sudden or rather instantaneous, and because it is produced by a firm and solid body: blood and matter being fluid, may be absorbed, and thus time may lessen that kind of pressure; but what can remove the compression of a firm and solid bone? Are we to remain, you would be inclined to ask, unconcerned spectators, whilst our patient labours under a visible depression of the cranium?"—These are real difficulties, and must be answered; and facts will hardly persuade you when balanced against such strong probabilities: but the whole question shall be fairly laid before you; it is one of those which I stand pledged to discuss with soberness and deliberation; it is one in which you must learn to decide on sure principles, since you are about to enter on that scene where responsibility rests on each of you, where you must trust to your natural reason, not to the dogmas of any teacher, and suit your practice to the various exigencies of each case.

There is a wide difference, in theory and in fact, betwixt the oppression proceeding from extravasated blood, and that from depressed bone. It is because bone is firm and immoveable that its depression does no harm! for the pressure it causes is permanent, not progressive; it is fixed and complete at once: if the patient be not struck insensible the moment the bone is beaten below its level, he never can become so; and you will find, by a singular variety of proofs, which I am now to lay before you, that he seldom becomes insensible. The brain is ca-







Fig. 2.



pable of accommodating itself to any degree of pressure which is fixed and stationary, and that arising from a depression of the skull is so slight that it can hardly be estimated; for the depressed portion is a very small segment of a large circle: the broadest depression possible is not equal to one-tenth of the whole convexity of the cranium. The smallest deviation from a circle seems very great, and that depression which is very visible outwardly, makes an inconsiderable impression within: the depressed portion of the cranium is so little off its level, that it merely exposes a rough and rising edge never exceeding the whole thickness of the bone: the fractured and depressed portion dips only at the line of fracture, and declines very gradually from the line where it is level with the skull to the line of its greatest depression: a depression even of three inches long, of the parietal bone, for example, (*Vide (a) figure 1. of fractured skulls*) declining gradually for two inches, and terminating in a depression of the depth of a fifth of an inch, (i. e. the full thickness of the most substantial skull,) must produce an abridgement of its cavity inconceivably small, as is marked and demonstrated by the dotted line (*c. fig. 1.*)

The slight effect that could, in the worst depressions, be produced by intrusion of the bone, would be to exclude from the regular circulation within the head a very trivial proportion of blood.\* But when blood is poured out, the effusion is not instantaneous but slow; every time the brain subsides, i. e. at each respiration, more blood exudes from the ruptured vessels; it is injected betwixt the skull and dura mater by the force of the circulation: this internal hæmorrhagy is probably not complete at first, but is renewed in paroxysms; it is not limited to one spot, but is diffused over the whole hemisphere of the brain: the extravasated blood has, by accumulating and coagulating, all the effect of a solid body: nay more, as it increases in quantity, in proportion as the brain yields, it acts with the force of a wedge, which presses harder the deeper it is driven. Such is the difference betwixt the injection of soft blood within the firm cranium, and depression of the skull.

But these are only arguments, which you dare not trust to; you must have proofs more relevant than these; and the facts I have to display are really singular. It having once become an acknowledged maxim, that the surgeon should trepan every fracture, and elevate every slight depression, no one having any opportunity of seeing a pure case of depression where the surgeon had not been busy, it might eventually have been very

\* Is pressure upon the dura mater nothing, or there is no chance of that pressure causing inflammation of the membranes of the brain? S.

difficult to prove that it is safe to leave such fracture untouched. But a thousand favourable accidents have betrayed the impropriety of this rash practice, and proved, in various ways, that the surgeon has been usually occupied, and often with extreme violence, in elevating fractures which had been better left alone. Sometimes, in the hurry and confusion of such a bloody scene, a remarkable depression of the skull has escaped investigation, the patient has escaped the violence and dangers of an operation, and the surgeon has been sensible of the deep depression only by feeling it through the scalp when the man was well: Sometimes relations and friends have interposed and prevented the well-intended operations of the surgeon, who has protested against leaving a great depression unreduced, and prognosticated death, yet the patient has recovered: Sometimes, the surgeon having leave to do his work, having made his perforations and pushed in his levers, has found the depression too deep and too firm to be raised; after every justifiable and every unjustifiable violence, he has been unable to raise the depression, and has not dared to cut it out; he has left the patient in this desperate state, and yet seen him recover after such violence, added to the deep depression: Sometimes when, from the foul air of hospitals, or the prevalence of epidemic diseases, the surgeon has been deterred from his favourite work, he has discovered, with equal pleasure and surprise, that "more recover (to use the words of Perusinus) by medicines than by the knife and the saw." Indeed, the conclusion against the profession and its general propensity to operate, in mere injuries of the skull, is stronger than I believe you are aware. I know that if you had seen with me the precipitation and violence with which depressions of the skull are torn up, and the miserable consequences arising from large openings, both your reason and your feelings would revolt against the practice.

"I chanced once (says Platner) to be called to the assistance of one who had fallen from the third storey of a house, and lay quite torpid and oppressed, as in a deep sleep. The surgeon, having shaved his head, found there a very deep and wide depression of the skull. While we were wondering how the skull could be thus deeply impressed by the fall, the integuments being but slightly ruffled, the man recovered his senses in a fortunate hour; alarmed at the proposal of an operation, he told us that the impression we had observed was of no importance; he had it from his childhood; and yet had lived in perfect health: he recovered without assistance." We are at a loss to conceive how, even where the integuments remain entire, so wide a fracture, and so much depression, can be consolidated without any ill symptoms; but several cases, which I have myself witnessed,



make the process quite familiar to me : and one related by Botallus I think particularly worthy of your notice : “ Some” (says Botallus) “ will very readily acknowledge that bones, fractured without an external wound, are easily cured in other parts of the body, while they deny the bones of the skull to be thus cured : I will relate plainly what I have myself seen. While I practised surgery, a boy, as I guess about seven years of age, fell from a gallery twelve feet high, and pitched directly upon his head : the parietal and part of the frontal bones were so fractured that you could feel distinctly the several fractured pieces, yet the skin (he having fallen upon a flat pavement) was not wounded, nor even the hair ruffled. When called, I was altogether confounded at finding such a fracture, the boy speaking, and in his perfect senses, with only a slight acceleration of pulse, (he was however insensible at first, and had vomited up his dinner along with some bile) a thousand thoughts passed across my mind, while those I had sent to the apothecary’s were returning with some medicines. I was for some time irresolute whether to make an incision and pick away the fractured bones, or to leave the parts entire : at last I resolved on this more lenient plan. In place of making an incision, I covered the whole head with Armenian Bole, Myrtle Berries, and Rose Leaves, mixed with vinegar and white of eggs ; and this astringent application I used during four days. The boy perfectly recovered without incision ; he lived many years ; and, though I do not recollect his name, I have reason to believe he is still alive.”\* This ingenuous avowal of Botallus, that he was altogether confounded at feeling such a fracture, and that a thousand thoughts had fleet-ed across his mind, makes the case highly interesting : we are conscious, from the conclusion of the case, how dangerous these thoughts were to the patient, and must feel that when they present themselves to our imagination, they should be resisted.

Parents have often, with seeming perverseness, refused assistance in the last extremity, and even the earnestness with which it is offered, is a motive for refusing it ; despair makes them unwilling to disturb the last moments of their child, which, being left undisturbed, recovers ; what the fate of such a child might be if trepanned, must ever remain doubtful.

I was called once to a child, whose circumstances seemed so very desperate that I urged the parents to allow of an operation, which fortunately they refused. “ This little girl, about twelve years of age, was playing with her school companions on the

\* I cannot agree with Mr. Boil in the propriety of the practice here commended, although the patient recovered. Though the general argument is correct, that it is not necessary to trepan every depression, the doctrine must not be pushed too far. See *the History of the Art of Surgery*.

very steep declivity of the Earthen Mound: two of them were running, hand in hand, when this little girl, losing the hand of her play-fellow, rolled from top to bottom of the Mound, with continually increasing velocity, till at last she pitched with her head full against a low wall, at some distance beyond the bottom. She was carried home in a chair, stiff and motionless, perfectly pale, and without pulse; she hardly breathed; and we had no evidence of her being alive but a slight degree of warmth, which, after cutting off her clothes, (for she was stiff as well as motionless) was difficultly increased to a natural warmth.

“ From this time she lay in a deadly stupor, with a blemish on one temple; there was no tumour, but flat integuments, through which I imagined I could feel a fracture and depression of the parietal bone, while the signs of accompanying extravasation seemed very unequivocal: her limbs were stiffened; her whole frame in a sort of tonic or permanent convulsion: her jaws firmly and immoveably locked; her extremities cold, and her pulse oppressed and intermitting. In this state she lay for four or five days immoveable; hardly was a tea-spoonful of wine and water admitted betwixt her teeth, which were firmly and immoveably closed. I was then persuaded, and remain so, though she happily recovered, that there was extravasation under the parietal bone; and my persuasion was so great that, on the fourth and fifth days, I solicited her parents to allow of an incision, and even spoke to the clergyman, who was called to them at this dismal time, to persuade them to consent. On the sixth day she yawned widely, and from that moment her jaws were loosened: we could now put in a few spoonfuls of wine and water, and give purgative medicines; but she lay still and dead, in the most profound stupor I ever witnessed. She began in the second week to stir the limbs of one side a little, and in two days more she stirred sometimes an arm, sometimes a leg, of the opposite side: then her eyes opened at times, and she began to mutter and speak; but it was the fifteenth day before this low muttering came on; and then, and till the twentieth, though her eyes were open, we had unquestionable evidence that she could not see; a candle approached to the eye gave no sensation, the eye did not follow it, nor were the eyelids closed as expressive of impatience of light, and the pupil was as much dilated as if she had lain in a dark place.

“ She now became restless, the struggling of the limbs of both sides increased, she put out her hands and stretched her limbs with a sort of trembling, and muttered perpetually. On the fourth week, she came to swallow more easily, to take the drink which had hitherto been poured into her mouth, and to speak rationally. She next sat up in bed, was raised into a chair, and

gradually recovered her senses and her strength. She was then able to be led about the room, but two months elapsed before she could be said to walk: even then she was never left alone, nor walked unsupported. She was led about the whole summer in this weakly condition; but is now a strong and healthy girl.”\*

But the practice of those who believe it to be their duty to scrape every fissure, and raise every depression, who are ever ready *to go to work with their instruments*, affords the completest proof of the improvidence of such practice; and we find practical errors narrated, by the best modern surgeons, with a non chalance, and want of consciousness, altogether astonishing. “I cured a boy, (says Marchetti) of seven years of age, who, from the kick of a horse in the forehead, had a very remarkable depression, which neither tripod nor lever could any way elevate; but there being a fissure in one part, I betook myself to the rugin, dilated the fissure, so that the serous humour had leave to exude, while the medicines had leave on the other hand to penetrate to the dura mater, so that in the course of forty days, flesh being regenerated in the fracture, the wound was safely and soundly cured.” But, had the celebrated Marchetti been permitted (as it was a wonder his authority did not prevail) to trepan this little boy, to tear up the skull with his tripods and levators, it is possible at least, that even after such violence, he might have survived, and then the operation and the operator would have been applauded for saving the patient’s life; and had the elevation of the bone been accomplished, though with every circumstance of violence and rudeness, the operation would have become memorable. Such a case is that recorded by Mr. O’Haloran, in which every principle of sound surgery was violated. He found a child with a depression of the skull with the integuments entire, and the senses quite composed and perfect, when, without any motive but his own fears, he cut open the scalp; and that depression, which had hitherto done no harm to the child, he elevated in the rudest and most shocking manner, making no fewer than four perforations in the skull of the child, thrusting into each hole a levator, and to his four levators he had two surgeons, who seem to have had as little tenderness as himself, for they pulled with might and main, till the depressed bone rose with a sudden spring. But here is his own narrative.

“A girl, about seven years of age received a severe fracture, with profound depression, on the left parietal bone; the integuments were entire, the girl quite composed and sensible, but the

\* This case shows what *may happen*, but would Mr. Bell himself prognosticate a similar issue, under similar circumstances? S.



*depression was so deep that it could contain a very small egg. Such was her situation when brought to me half an hour after the injury. Seeing that it would require three or four crowns of the trephine to raise this extended fracture, I requested of Mr. Wallace, a military surgeon, and Mr. Pierce, to assist me in this charitable work. I removed all the integuments, wiped away the blood, and whilst these gentlemen with their fingers made compression over the bleeding vessels, I began to operate on the inferior parts of the bone. I then commenced a second on the upper part, and in a line with this; but two elevators, though acting at the same time, had no effect on the depression. Two more crowns were then applied to the sides of the bone, and parallel to each other. Four levers acting in conjunction, it astonished me to see with what a sudden spring the depressed parts resumed their former station. Notwithstanding the great extension of this fracture, the loss of covering, and of the bone itself, by four crowns of the trephine, this girl never after had the smallest untoward symptom."*

Is it by such narratives and such proceedings that the good repute of surgery is to be preserved? by no means: we should at first sight be inclined, both from the violence used in raising this depression, and from the success of the operation, to ascribe the patient's safety to the intrepidity of the surgeon; but what should we have said of Mr. O'Halloran's practice had he miscarried, and been unable, with his military assistants, his pair of surgeons and double pair of levators, to raise the depression, and yet the patient, after all kinds of violence being added to the depression, had lived? There is not in the narrative of this case any shadow of proof that the patient was saved by this mode of operation; the child was composed and sensible, had no bad symptoms, and would (*might*) have had none to the very end of the cure, had she been left alone: it proves merely what is but too surely true, that often the patient survives the most imprudent things the surgeon can do.

I will now produce you evidence that I put no worse construction upon this case than it should bear; it will prove to you, that, even where the depression is broad and deep, where convulsions have ensued, where the surgeon, alarmed at these signs of danger, has made his incisions and his perforations, and tried ineffectually to raise the depression, the patient has survived both the depression and the ineffectual operation, which must ever be a violent one. Mr. Hill undertook, in an unfortunate hour, the following operation. "A boy of the name of Carson, between five and six years of age, by the kick of a horse, had a *long piece of the os frontis beat in flat*: he slept sound, as the people termed it, about two hours, and then



fell into strong convulsions. The extravasation was so great externally, that the precise quantity of the bone depressed could not be determined, till the blood was discharged by a horizontal incision along the depression, by which I discovered it to be of an elliptical form, extending above two inches across the forehead, and above the right sinus frontalis, with a fissure all round it. The external discharge not relieving him, showed that the perforation would be necessary; and, therefore, after allowing the first incision to bleed some ounces, it was stopped by dry dossils. Being determined, for the reasons formerly given, not to touch the depressed part, unless some symptoms should afterwards make it necessary. I continued the incision till there was room for perforating a quarter of an inch from the fissure, at the right end of the depression. The bleeding was troublesome; but no arteries required to be stitched, but were stopped by dossils dipt in ardent spirits, and applied for half an hour. After which just as much of the pericranium was removed as was necessary to admit the smallest head of the trepan. The connecting blood-vessels betwixt the dura mater and skull were broken through the whole extent of the depression, being at least two inches; for so far I introduced the levator, without opposition, and attempted, with a good deal of force, to raise it; but in vain.—After the extravasated blood was discharged, three intersected stitches were put into the first incision above the depression, and it united in a few days; and the rest of the skin healed in four weeks, without the intervention of any bad symptom.—He is well, 1771; and the depression, owing to his youth, is so expanded by natural growth and callus, as not to be much perceived.”

If any thing could repress the presumption of a man of an adventurous temper, this must: to propose an operation under protest, that it was the only possible means to save the patient's life; to attempt that operation; to see the patient survive the depression which had been declared fatal, unhurt by the additional violence of incisions, trepans, and levers! Surely these facts should lead the surgeon, who had been in the habit of elevating inexorably every slight depression, into a new train of thought.

The prominent points of this case of Mr. Hill's, stand, in common sense and plain argument, thus: First, the depression, while it continues, does no harm, the boy being in his entire senses: Second, the surgeon is so alarmed at the very appearance of depression, that he labours with every degree of violence to raise it, his own reputation, as well as the patient's

health, seeming to be at stake : Thirdly, abandoning the operation, and leaving the depression as he found it, he puts three stitches in the wound, and so the integuments unite over the depression in a few days : Fourthly, the patient is no sooner recovered, and the wound healed, than the depression, which appeared so formidable to the surgeon when seen and felt at the bottom of a bloody wound, the depression, to raise which he willingly risked every thing, disappears spontaneously, so little is it off the level.\*

I will now relate the circumstances of an operation in which I was a party ; where although I was obliged to be a witness and unwilling assistant in much mangling, I saved the man a great deal more. There was, along with a wide fracture of the parietal bone, through which the extravasated blood was seen, a slight depression of it at one corner of the fracture : the trepan was applied : the extravasated blood rolled out : the duty of the surgeon was, according to my apprehension, completely fulfilled ; but he was urged by others who were present to raise this depression, with a degree of earnestness which left him entirely responsible for the consequences. I most unwillingly witnessed, but would not consent to assist in this part of the operation. After extreme violence (for always the violence is extreme where the surgeon works till he is foiled) it was found altogether impossible to elevate the depressed bone. The operator was now called upon, under the same responsibility, to make one, or, if necessary, two perforations, on the sides of the depressed portion, to raise it. I saw plainly that, if the operation, now protracted for an hour, should continue still

\* These are not solitary, nor even rare cases. Read the following from Mr. Hill. " February 24, 1750. Mr Robert Rae, when a young man, fell backward from his horse on a rock, about twelve miles from Dumfries. By his foot sticking in the stirrup, he was dragged some way, till the girth broke, and left him with his head betwixt two stones in a rill of water, where he would soon have been suffocated had not a shepherd boy drawn him out.—A large piece of the left parietal bone was driven in backward to the lambdoid suture, with a fissure in the right parietal forward, being like a shepherd's crook : notwithstanding the larger depression, there was no extravasation ; *nor would the bones rise, though a very great force was employed ;* but they exfoliated like the former, and, the aperture being wider, the protusion was greater. The cicatrix continued soft for three years, when it ossified completely.

† Mr. Bell's criticisms on Mr. Hill's operation, if the case is entirely related, do not appear to be altogether correct. He says " the boy was in his entire senses," when Mr. Hill says " he was in strong convulsions." Although the depressed bone was not elevated, yet the extravasated blood was discharged ; a circumstance of no slight importance. Mr. Hill says, that " owing to natural growth and callus," which implies considerable length of time, " the depression was not much perceived," and not that it disappeared when the boy recovered. S.

another hour, the man would be carried off delirious; that if the skull was widely opened by two perforations, and by the tearing away the depressed bone, his chance for life was very slight. I said across to the surgeon, that if he would permit me, I should most willingly take the responsibility upon myself. On his consent, I put aside the busy fingers that were searching for depressions, clapped a piece of lint on the dura mater, and conveyed him to bed, where he mended daily, and became a very stout and healthy man.

The bloody decrees of the surgeon against all who have depression of the skull are never so absolutely suspended, as where the ill constitution of the air in a great hospital is known, by the experience of centuries, to destroy all those who suffer operations on the head. Under this imperious necessity was Dessault, surgeon of the Hotel Dieu, who, during his administration, declined, even in the most urgent circumstances, to perform the operation of trepan.

Dessault's clinical practice, when he merely allowed the patients to lie undisturbed and quiet, with a poultice to the fractured and depressed skull, and a dose of calomel to move the bowels, exhibits a splendid series of examples of what nature, *undisturbed* by partial operations, will do; and taught Dessault himself, and proved to the profession, how great a proportion of those who are trepanned would live without the help of surgery: for many recovered after lying long in a state of stupor, accompanied with symptoms every way alarming, such as would, in any other circumstances, have induced Dessault or any surgeon to have trepanned.

But Dessault, who was too much inured to bloody scenes to fear operating, and too indifferent to the reputation of being an operator to feel any thing of the passion for cutting and trepanning, tried, for the first time, the great and important experiment of leaving his patients, having fractures and depressions of the cranium, at quiet in their beds. Among others, one Joseph Gautier's condition was in every sense interesting, but especially in the slow absorption of that general suffusion of blood, which we must presume to have taken place in the brain after so violent a concussion as he seems to have suffered, and the gradual recovery of his senses, proportioned in all likelihood to that absorption, and accompanying it step by step. "Joseph Gautier, a hale young man, twenty-three years of age, was found in the morning under a window, which he was accustomed to scale when late abroad, lying in a state of stupor, and bathed in his blood, which streamed from his mouth and nostrils, and from his left ear. When he was brought from his village, a few miles distant from Paris, into the Hotel Dieu, he was



still bleeding from the mouth and nostrils, and insensible ; the body cold, the face deadly pale, and the pulse small and contracted. On his head were many marks of contusion ; and one over the lower and fore part of the parietal bone, was accompanied with a depression, deep in the centre, and rising towards each side. The clavicle, which was also fractured, being set and bandaged, the head was wrapped in a large poultice : next day he was better ; the poultice was continued, and he was bled in the foot ; and in the evening his senses in some degree returned. On the sixth, he began to articulate, but indistinctly. By the seventh his senses were restored ; his taste, smell, and touch were perfect, but his vision somewhat impaired : he heard also imperfectly ; and, in respect to his intellect, the faculty of memory seemed much weakened ; he could by no means recollect whence he came. He had no pain : it was on the tenth day that he first rose and walked : on the fourteenth, he walked abroad upon the bridge, and took his airing there daily, till the twentieth, when, the fractured clavicle being reunited, the bandages were undone. His memory mended daily ; his hearing became more acute ; his eyes gained strength, but still the pupils remained dilated somewhat wider than in the natural state, and the skull remained manifestly depressed. On the twenty-seventh, he was carried into the hall at lecture, and shewn to the pupils : this was before he was dismissed. At the end of three weeks, he returned to show himself, his senses being entirely restored, and his memory perfect : the pupils of his eyes had recovered nearly their natural smallness, except that the pupil of the left eye continued a little wider.\*

In this case, when about the third day, the bumpy swelling and ecchymosis began to subside, they felt the fracture and depression very distinctly, the fracture being of a circular form, about two inches and a half in diameter, with one edge more raised than the other ; and after his recovery it was still more plainly felt.

"The invariably fatal consequences of using the trepan in the Hotel Dieu, deterred Mr. Dessault from using it on this occasion ; nor had he any reason to repent of his resolution." Even when the depression seems to produce the worst signs ; when the patient bleeds from the nose and ears, and lies insensible ; when his senses were not merely stunned and shocked, but so materially injured that they recover slowly, it is safe to leave the depression untouched ; to trepan where there are no such signs would be destruction. Mr. Abernethy "had a man brought to St. Bartholomew's, who was hit on the forehead

\* Deffault's Chirurgical Journal, Vol. I. p. 17.



with a brick : the frontal bone was fractured half an inch above the orbit ; the fracture measured two inches in length, and the upper portion of the brow was depressed about the eighth of an inch. *He was not even stunned by the blow, and walked to the Hospital without assistance*, complaining only of soreness in the wounded integuments. He was bled ; was confined, much against his inclination, to a scanty and liquid diet, and was purged every second day. This patient did not experience any illness, and the wound soon healed." But had Mr. Abernethy been a surgeon of the complexion I have sometimes ventured to describe ; had the patient been confined, much against his inclination, *to an operation-table, and trepanned*, there is little doubt, I think, how it would have fared with him.

But this is the difference betwixt the proceedings of a man of sense and experience, and a man of theory. There has been too much of surgery ! A master in surgery can look, calmly and composedly, on that depression upon which a novice would instantly fasten his levers ; he can see the scalp whirled off from both sides of the skull ;\* the parietal bones laid bare ; the tem-

\* "A lad, seventeen years of age, had his head pressed between a cart-wheel and a post ; by which accident the scalp on both sides was turned downwards, so as to expose the lower half of the parietal bones, the squamous part of the temporal, and also part of the frontal and occipital bones ; about a quarter of the cranium being thus denuded of its coverings. The periosteum was in several places stript off from the skull, the scalp much bruised, *and the posterior and inferior angle of the left parietal bone was beaten in*. The depressed portion, which was visible, *was an inch in length, and more than the eighth of an inch below the level of the cranium* ; but the fracture extended along the squamous part of the temporal bone, towards the basis of the skull : it could not, however, be traced, as the temporal muscle had not been removed from that part by the injury. The scalp being cleansed, was replaced, retained in its situation by slips of sticking-plaster, and a slight pressure by bandage, was applied. *The boy was perfectly sensible, his pulse regular, and not quickened*. He had bled considerably from the temporal artery, which had been divided by the accident : eight ounces of blood were, however, taken from his arm ; and some purging medicine was administered next morning, which procured three or four stools. The next day, (Friday) his pulse beat nearly 120 in a minute ; his skin was hot and dry ; and he complained of pain in his forehead. Twelve ounces of blood were taken away, and four grains of pulvis antimonialis ordered to be given three times a day. On Saturday, the former symptoms still continued, and were rather increased. The antimonial powder made him sick, or at least increased his disposition to be so. Fourteen ounces more of blood were taken from him ; the vibratory feel of his pulse not being altered until that quantity was taken away : the blood, on standing, appeared very buffy. His skin, notwithstanding all this, still remained extremely dry ; some antimonial wine was given, which produced vomiting. On Sunday, his pulse was evidently lowered by the evacuations he had undergone, but it was still quick and sufficiently strong. The pain of his head remained as before. Having a sufficient number of stools, and the sickness still continuing, the antimonial powder was omitted. He was bled, however, in the vena saphena, and his feet and legs afterwards immersed in warm water ; during which, he, for the first time, perspired copiously. A blister was also applied to his neck.—The scalp united, with only a trifling suppuration over the fractured part of the bone ; and to this ready union, the lowering plan, by preventing inflammation, seems very materially to have contributed. The matter collected over the fracture was discharged by a puncture, and the boy got well."—Abernethy.

poral and frontal bones also denuded; *part of one of the bones beaten in, for an inch in length*, and more than the eighth of an inch in depth, and a fracture extending downwards to the basis of the skull,—and yet refrain from trepanning. He can see a fracture similar to this, with a part of the bone depressed *even a quarter of an inch below its natural level*, without thinking of making an effort to raise it; and can even see the boy sicken on the third day, with headach and disturbed sleep, with dozing and a slight convulsion, without being moved to do any thing rash or unbecoming.\* While the tyro, just sent out from the schools, makes diligent inquisition into all the circumstances of a fracture, will allow not even a capillary fissure to escape his jealous search; and, where there is hardly any visible fissure, imagines such internal damages as may entitle him to “set to work with his instruments,” and perform that great operation, which is to be the pride of his future years, “boasting of that which is his shame.”

It is not honourable to our profession to have it thus proved, that while the opinion is almost universal that depression of the skull must oppress the brain, the fact is entirely the reverse: that, wherever by chance such depression has passed unobserved, or the friends have refused all surgical help; wherever, by the deepness and firmness of the depression, it has been impossible to raise it; wherever the danger of infection has deterred the surgeon from operating, or he has resisted the temptation, and, by an effort of good sense, has ventured, at the risk of his reputation, to disregard the established maxim, the patient has done well. This is enough to throw a doubt upon all that has been doing for centuries; and makes it a duty to tell you plainly, and without reserve, that the desire of leaving, in a dangerous operation, nothing undone, is not wise, and leads to nothing but rashness and violence: it is a prejudice so na-

\* A boy, about twelve years old, received a kick from a horse in Smithfield, which stunned him; and he was immediately brought to the hospital. The integuments of the forehead were divided by the injury, and the superciliary ridge of the frontal bone depressed *at least a quarter of an inch below its original level*; the depressed portion measuring about an inch and a half in length.

It is obvious that the bone could not be thus depressed, without a fracture of some part of the basis of the skull occurring at the same time, on which account the case might be considered as more dangerous. *In less than two hours he had recovered from the immediate effect of the blow, being at that time perfectly sensible*. Fourteen ounces of blood were taken from his arm; his bowels were emptied by a purge, and saline medicines, with antimonials, were directed to be given. He went on tolerably well for two days, at the end of which time, evident symptoms of considerable irritation of the brain took place. He now complained of pain in his head; slept little; and, when dozing, often started, or was convulsed in a slight degree. To remove these symptoms, he was bled twice, took opening medicines occasionally, was kept quiet, and without light, and was allowed only a spare diet. By continuing this plan for about three weeks, he perfectly recovered.

tural that it should be resisted ; it is a manner of reasoning, which is worse applied to this operation than to any in surgery. To leave a Second Stone in the Bladder, while performing the operation of Lithotomy, is to do nothing : to leave diseased glands in the Axilla, when extirpating a cancerous breast, is to do worse than nothing : but to leave a *slight* Depression of the skull, even when the patient is stunned and sickened, or *any* depression where there are no bad symptoms, where the integuments are entire, when the patient is young, is to make a just and modest sacrifice of our wishes and prejudices to the safety of our patient.

## SECTION IV.

*Exceptions to the general Rule of leaving Depressions to Nature ; or Definitions of those Cases which actually require the use of the Trepan and Lever.*

I know not whether I have persuaded you, but I have myself, to the most entire conviction, that of all the injuries of the skull that which is the most dreaded, viz. depression, is the least hurtful. I have seen such happy recoveries, where the depression was left undisturbed, such melancholy scenes when depression was raised at the expence of large perforations, and extensive openings of the skull, that I confess myself very indifferent to this kind of danger, and very doubtful of the propriety of such operations: the practice which I think so very hurtful, it is my duty to oppose ; and I shall now endeavour to keep my promise with you, of explaining, first, the general rule, so as to give you confidence, viz. “ That you are not to trepan, nor elevate every depression: and, next, “ the exceptions, so fully as to prevent you, while you avoid the fault of hurry and impatience, running into any fatal error from neglect.” You will find that I have considered these exceptions seriously, and that I retrace my opinions on this point to observation and experience.

First, The general principle which I have laid down is illustrated, and, I believe, proved, by this figure, (Fig. 1. sheet 1.) where (*a*) represents the point from which a fracture of the parietal bone is bent down ; (*b*) the natural level of the skull ; (*c*) the extent of the depression, deep and formidable when seen and touched outwardly ; but the space betwixt (*b* & *c*) demonstrates how very little the depressed bone is off its level, how partial and trifling the pressure must be, how slight an intrusion this is upon the convexity of the skull ; and the truth



which this plan demonstrates as probable, is proved beyond a doubt, since, under the most extensive depressions of the skull, the patient preserves his senses. Nothing is more essential than that you should have clear conceptions of the motives for applying the trepan: it is one great point gained, to say with confidence, that "this of depression is not among the number." I never saw depression occasion stupor, nor the elevation of it bring relief; but many times when the surgeons have been busy, in a mob, struggling and elevating depression, in a manner almost as rude as that of O'Halaran with his four levers, the boy or man has been struggling, remonstrating, and making every kind of resistance: \* nay, it is most singular, and not to be found in any equal number of injuries of the head of any other complexion, that, in all the instances of deep and wide depression which I have just quoted, or have yet to quote, the patient was sensible.†

Secondly, Though this general principle cannot but be acknowledged, it remains to be circumscribed by certain definite rules: as we should take different measures in a clean cut of the integuments, and a rude and mangled wound, where the parts were bruised, lacerated, and unfit for adhesion, we must take various measures in fracture of the skull, according to its peculiar circumstances; and as there are circumstances which are found to prevent the adhesion of wounded integuments or wounded scalp, there are many which will prevent the healing

\* There are, in my recollection, no cases, and I find in my readings very few, in which the depression seems to have occasioned stupor, or the elevation of it given relief. The following observation from La Motte, is perhaps worth your notice as much as any.

"A boy" (says La Motte) "was rode over by a young prancing horse, which pranced upon him. There was a great wound, and much bone naked; and besides there was a considerable depression, apparently made by the cauker or heel of the shoe. This boy I found lying on his back, crying out continually that he was falling, that he was falling down! I trepanned, introduced the levator, and raised the depressed bone. This boy, while the bone continued depressed had continually the feeling of a drunken person, of the room running round with him. but the moment the bone was raised, and the extravasated blood evacuated, he recovered his senses." P. 320.

† A case is related by Mr. Cline, in his Lectures, of a seaman on board an English ship in the Mediterranean, being knocked down by something falling from aloft. He was rendered insensible by the blow, and in this state was carried to Gibraltar, where nothing was done for him, and thence to London, to St. Thomas' Hospital, still in a state of insensibility. Those who were with him knew when he wanted to eat or drink, by certain motions which he made. He had likewise a catching of the fingers of one of his hands. His head being shaved, a depression (of one of the parietal bones, I think) was discovered, for which Mr. Cline operated. That very evening the motions of his fingers ceased, and in a few days his senses were entirely restored. What is very remarkable, when he first became rational he thought himself still cruising in the Mediterranean, having no idea of the lapse of time, or change of situation, which had taken place. I do not recollect how long he remained in that insensible state, but it must have been several months. S.



of a fractured skull, and cause it to inflame the bone, and affect the dura mater: These are the exceptions, and they must be defined, and I will now describe that kind of depression which I judge to be safe. It is not by present pressure that fracture is dangerous; therefore, when it runs in a right line, when there is a general depression, but no particular point forced in upon the brain; where the declination of the depressed from the sound part of the skull is gradual and uniform; when the whole line of fracture is generally depressed, and the central point sinks rather deeper only; though you can feel the hollow with your finger, and can see it (not without apprehension) when the coagulated blood is discharged; yet as the centre does not intrude materially upon the brain, as this point does not dip so as to present points or spiculæ to the dura mater; as there is no rough edge presented on the inward surface, nor any rude shock, like that of a ball, to deprive the bone of life, and prevent its healing; as it is broken by such a force as fractures other bones, and is surrounded (as marked at *d*, fig. 1.) with a mass of cellular substance, thickened by inflammation, and by the injection of blood into it, such as re-unites other fractures, the skull, pericranium, and dura mater, all mutually adhere, and the effects of such depression are never felt.

Upon every principle, and every precedent, taking care, however, to watch the slightest appearance of fever, rigour, puffiness of the scalp, flabbiness, or gleet discharge from the wound, we are bound to commit such a case to nature: it daily happens that boys have the forehead thus flattened by the kick of a horse; sometimes dangerous spiculæ, as where the caulkers of the shoe have pierced the bone, are cut away, and very properly, with the trepan: sometimes, too, the bone is elevated; but very often it is left untouched, the wound lightly stitched, and dressed dry, and the parts re-unite and heal as in any other wound, a visible, but harmless, depression remaining. While the integuments are entire, the inducement to leave them so is particularly strong;\* when left entire, the consolidation of the parts, and the absorption of the blood, is certain, or almost so: to open it, is to convert a simple into a compound fracture, with every danger of its not healing favourably. I remember to have put in my finger, through a wound in the scalp, and felt, in a very

\* If you follow this advice, how can you know whether or not there are any spiculæ of bone driven in upon the dura mater? I have been, after the example of Mr. Birch of St. Thomas' Hospital, in the invariable habit of laying open such tumours, never with any injury to the patient that I could perceive, and often with manifest advantage. When all danger of bad symptoms vanishes, the incision may be healed in a few days. S.

old woman, near 70 years of age, a depression of the parietal bone of two inches of extent, the fracture wide, the edges rough, and the depressed bone apparently driven far below the unhurt part of the skull; and the only notes I have taken of the case are, that she never passed one sleepless night, nor had one hour of sickness; her appetite never declined; that she sat up to be dressed, and kept her bed a few days only, through precaution, rather than for want of spirits or strength, and recovered as from the most ordinary wound. In those less advanced in life there is less danger; and we have the best authority (the authority of those whose general practice is to use the trepan) for affirming, that in such cases, not only the present depression does no harm, but the fracture unites, and the wound closes; the patient may even be seized with shiverings, and the part with suppuration, (strong reason for suspecting a carious bone) yet such abscess, being punctured, will discharge "a considerable quantity of matter," and the patient be in no danger: nay, we are assured, on the same impartial testimony, that a bone loose, and somewhat depressed, will fix again.\* But in boys especially, where depressed bone has in general no sharp edges; where the skull rather bends than breaks; where the bone is vascular and growing, and the circulation in it and in the integuments sound and vigorous, the chance of a fracture's healing is so great, that I would not presume to touch it, unless in most peculiar circumstances; especially as in boys the dura mater is too tender to serve as a second skull to sustain the pressure of the circulation within the brain: wherever it is necessary to make large openings in the cranium of boys, protrusion of the brain and death ensue.

It is not then the present, but the remote consequences of depression we have to dread; a depressed fracture is more apt to become CARIOUS than one that is direct or linear; and it is as a fractured Rib or Sternum inflames the Pleura or Pericardium, that depressed fracture of the skull by becoming carious inflames the brain. This is an *accident* which may happen in any form of fracture, where the bone is but laid bare, or scratched, or punctured, as well as where it is depressed; it is one for which the surgeon, who has endeavoured to re-unite the fracture, can be no more blamed than he could be blamed

\* "Samuel Haste received a wound on the upper part of the right parietal bone, of two inches long, with a *loose bone and fracture*. Though the fracture could not admit of a doubt, yet there seemed to be but little depression, and the sides of it were firm to the touch. I saw no reason for the operation at present, but carefully attended to the symptoms. In the space of four weeks the bone became covered, the wound healed, and he has since enjoyed perfect health."—*O'Halloran*

for an extensive suppuration of the scalp, where, having stitched the lips of the wound lightly and nicely together, and taken every pains to prevent suppuration, it had yet suppurated; but it is an *accident* so frequent, and indeed so much depending on peculiar forms of fracture, as to occasion a variety of exceptions to the general rule.

*Thirdly*, The first exception which I would explain to you, is not of this nature, but depends on other concomitant circumstances. A fracture, with or without depression, may be of such extent as to indicate great violence, the concomitant symptoms announcing extravasation: the fracture traversing the channel wherein the great branches of the arteries of the dura mater are lodged, they are often lacerated, and pour out much blood, which may be actually seen oozing through the chinks of the fracture, and in such circumstances it is our duty to operate: but then our sole motive for operating is to relieve the brain from the blood which oppresses it, not on account of the fracture, which only marks the place of the chief violence. Figure 2. may represent such a fracture; where (*a*) marks a wide fracture (through which the black blood is seen) running down into the orbit, perhaps into the basis of the skull; (*b*) two other limbs of this wide and gaping fracture, running down along the temple, and backwards through the parietal bone; (*c*) represents a large corner of bone depressed, apparently loose, and so surrounded and insulated by the various chinks of the fissure, that you would believe, first, that it would be easily removed if that were reckoned prudent; secondly, that it must be perfectly easy to elevate the slight depression of a bone so insulated; thirdly, you would be naturally inclined to fear that such a bone could not have sufficient circulation to live: but all this is deception, a very common deception; for such a bone is steady, immovable, cannot by any force of the levator be elevated, and lives, and granulates: (*d*) marks the trepan circle which should be made in these circumstances, and the piece of bone being sawed through and picked away, the half-coagulated blood rolls out as black as pitch, and the patient is relieved, and finally saved.

This represents in truth the head of a very stout sailor lad, who, in going out upon the main-yard, to get in the studding-sail boom, fell clear from the height of the main-yard: no stay nor tackle broke his fall; he had not a wrist, nor any part pained or bruised; he lighted full on his forehead, which bore the whole force of the fall, and, by hitting a cat-head, (a solid projecting clump of timber, round which the tackles are secured) his skull was fractured with deep and wide rents, running down towards the basis, in every direction. This happened on Sun-



day evening; he was immediately carried down to the cabin, and lay long insensible, and when he revived, found himself cold, giddy, sick and powerless, and continued to vomit for some hours.

On Monday, when I saw him, there was no delirium nor confusion of intellect, night nor day; no faltering of the tongue; no dilatation of the pupil; no sign nor degree of palsy in the left side, and the vomiting had ceased: he complained of nothing but of indescribable suffering in his head, and a sort of oppression and misery during the night; yet his condition was very decidedly marked by a sign, which I have seldom found deceive me, a slowness and marked intermission of the pulse, which, throbbing slowly and heavily, pauses at every fifth or sixth beat. The wound in his forehead was right-lined, of small extent, about an inch and a half; not mangled nor lacerated; the lips not puffed up by extravasation, but simple, as it had been made with the blow of a poker; and through this wound the probe, passing obliquely, discovered a slight depression, a rough edge of bone, and wide fractures, through which the buttoned point of the probe might have passed. His condition was singular: he was a big and fleshy lad; and, from the steadiness of his posture, the sluggishness of his motions, the manner in which his limbs were folded, and the slow and oppressed way with which he spoke, from the slowness of his breathing, together with various indescribable circumstances, one felt, while standing over him and rousing him to answer questions, as if conscious that he lay heavy on his bed.\* His answers, even to the most curious questions, were circumstantial and correct; but they were extorted by urging him to reply: his answers to each question were delivered slowly, after drawing a long breath, and with an oppressed sigh. He seemed to feel great oppression at the scrobiculus cordis: his head always dropped upon his breast; and his hands, when you raised them, dropped heavily by his side. You were conscious of the pain it gave him to renew a conversation, by the slowness and sighing with which he began his replies: he lay still, oppressed, breathing slowly, with deep inspirations, and he had a corresponding pulse, for it throbbed slow and heavy, beat just 50 in the minute, and at every fifth or sixth throb, it paused distinctly the space of one slow pulsation.

His suffering during the night, he said, was inexpressibly great, but it was such as he could in no shape describe. He was told how doubtful his condition was, and how likely that we

\* I do not scruple to copy expressions of this inaccurate kind from my case-book, when I find them, however incorrect, to be suited to convey those lively impressions which one has only in the moment of looking upon a patient.



should advise him to submit to an operation. After passing one night more in this oppressed condition, he allowed us to elongate the incision, making at the same time a crucial one, by which these terrible fractures (fig. 2.) were displayed ; but the inner surface of the flaps of skin was so exquisitely sensible, and he was so far from feeling all his misery, that he insisted upon being carried to bed.

But, two nights more of that indescribable suffering, which he had tried to express to us, quite subdued him : he said, " whatever we pleased to do with him, was now welcome." The flaps of scalp were now, on Thursday, in a state of suppuration ; the black blood was, at the time of incision, distinguished through the fissures ; and upon the circular piece of bone (*d*) being cut with the trepan, rolled out in large clots. I could feel a great hollow betwixt the scull and dura mater, which was depressed by the extravasated blood, and the probe passed along unobstructed for several inches, in every direction, from the trepan hole. To talk of repeating the perforations till an extravasation of this extent were uncovered, would be to think like a school-boy : the process was in this case simple and uninterrupted. The patient's anxieties and oppression were gradually relieved. He was trepanned on Thursday : on Friday he felt quite relieved ; on Saturday, his slow, throbbing, and intermitting pulse, had risen from fifty to eighty in the minute ; and at each dressing the blood diluted with a sort of serous exudation from the surfaces melted and flowed out. At the first dressings, I made way for its flowing out more freely, by introducing the probe, wrapped in oiled lint, and moving it gently round betwixt the scull and dura mater ; and as the dura mater rose, which it did visibly from day to day, it assumed a vermeil colour : the scalp, bone, and dura mater were, in course of a fortnight, one undistinguished mass of red granulations ; the process of healing was rapid and uninterrupted, not even interrupted by the loosening of a small piece of bone, which was partly cut by the trepan and partly insulated by the fracture, and which I picked away, without the help of forceps, with the probe. I find that, on the Sunday following, I had been obliged to turn out large clots of blood with the probe, which presented at the trepan hole, and extended far under the scull ; and that, on the following days, I was occasionally obliged to use the syringe, with tepid milk to wash out clots.

*Fourthly,* Yet you must perceive, that it is not in such cases, that the gaping fracture, or even the excessive depression, that is an object of concern, but that the extravasated blood is at once the cause of the danger and of those signs which denote its existence : and those signs of extravasation may be so decisive, es-

pecially when conjoined with fracture and depression, as to induce you to cut open the integuments and perforate the scull. This was proved by the following case of a fine sailor boy, about fourteen years of age, spirited, active, and very thoughtless. While the vessel was unloading, he tripped in skipping about the deck, pitched headlong into the hold among casks, and was carried up into the air in a state of stupor, bleeding from the nostrils and vomiting. There was no external wound, but a universal extravasation of blood into the cellular substance of the scalp, especially over the right eye-brow, by which the eye was almost closed. It was some time before he was removed from the ship in the roads; and when I first saw him, it was easy, through the integuments, swelled as they were, to distinguish fractured edges, and a depressed bone; but the extent or form of these could not be ascertained, and indeed they never should have been with me a motive for making incision into the swelled scalp, but that he lay still in a state of stupor, vomiting, and bleeding from the nostrils: his stupor was not the deadly snoring of the apoplectic state; it had the peculiar character which I have just attempted to delineate: he could be roused, was sensible and rational when excited, but still he was in a state of stupor, into which he instantly relapsed. Generally the removing the patient to an operation-table, and almost always the first incisions, excite the patient, though delirious, he becomes rational, though torpid, he is roused; yet still, even when thus roused, his actions bear the character of stupor or delirium. This boy, when carried to the operation-table, was roused to a perfect consciousness of every thing around him; and, when the operation was done, said, "I think I have borne it with spirit."

This boy then was perhaps a fit subject for the experiment of trying how far the powers of nature might prevail, in at once supporting the system under oppression, healing wide fractures, and absorbing much extravasated blood; for while there was such extravasation outwardly, along with conspicuous fracture of the scull, there was great probability, almost a certainty, of extravasation within. It was an experiment I did by no means feel myself intitled to make; because the stupor, the vomiting, the hæmorrhagy from the nostrils continued: I therefore made an incision into the tumour, a long incision, which, directed by what I felt without, uncovered a long fracture. The lower part of the forehead was more swelled with suggillation; the eye was more closed; the edges of the incision, when laid aside, were more choaked with coagulated blood than could be well represented in a drawing: the coagulated blood was

also injected so into the cellular substance about the pericranium, that the fractures could be better felt than seen : but, one great fracture running down the forehead, passed into the orbit, and was so very wide that it easily admitted the handle of my scalpel : another limb of the fracture ran round in the direction of the coronal suture ; a whole piece and corner was deeply depressed, and so far locked under an edge of the sound bone, that it was necessary to make two perforations, and to cut off a small projecting corner with the finger-saw, before we could think of using the lever. The blood rolled out through the first perforation. The depression of the dura mater by the blood was as great as in the former case ; the circle in which, I could with the probe feel it detached, was as wide : the rising of the pulse, which had been oppressed ; the recovery from the stupor ; the granulation of the dura mater, and the closing of the wound ; and the daily issue of clotted blood, make this, in all respects, a just parallel with the case I have just related. The extent of the wound was such, that the boy was not dismissed till the 9th of January, the 7th of September being the day of his fall : but what surprised and gratified me was this,—the piece of bone, which had been depressed and elevated, actually moved with each pulse of the brain, so loose did it lie upon the dura mater. I feared, when I saw the dura mater through the trepan holes, red and granulating ; when on the 20th day from that of the operation, I found also all the exposed part of the scull covered with a fine and florid pile of granulations, this triangular piece of bone excepted, (which continued yellow, quite bare, and still moveable), that it must become entirely carious, and exfoliate ; and that this, by protracting the cure, or, by its exposing the brain, might bring the boy into new danger : I had this impression on the 30th of November, and marked it in my daily report ; but by the 6th of December, the same pile of florid granulations had crept along over the whole surface of this portion of the scull, and by the 14th the whole wound was cicatrized.

Such wide and gaping fractures, then, imply a very heavy blow, or a fall from a great height : I find them often accompanied with deep apoplectic stupor, with palsy of one side, dilated pupils, and involuntary stools ; with groaning and sighing, an uneasy tossing from side to side in bed, as if from oppression, and a frequent raising of the hand to the affected side of the head.

*Fifthly.* There is a kind of danger inseparable from certain forms of depressed fracture, which no experienced surgeon will despise. A flat and even fracture, having no particular point depressed, causing no stupor, and attended with no ill signs, is by no means a fit subject for operation : but, where (as



in fig. 3.) the fracture is radiated and pointed, where the bones do not "lie pashed or loose upon the dura mater," and yet are much shivered; where not a long flat edge is driven under the sound bone, but particular points are depressed, presenting probably on their inner surface spiculæ and irregular and jagged edges, there is imminent danger, not from the depressed bone lying heavy upon the brain, but from its points pricking the dura mater, whence, on the eighth or tenth day, inflammation extends from the membrane to the brain, shiverings and tremors come on, and the patient dies. Not the long and wide fracture (*a a*, fig. 3.) nor the general depression produced by the yielding of the three triangular portions (*b*, *c*, *d*.) are the cause of danger, but the dipping in a more perpendicular direction of the point (*d*), which, being central, has received a great proportion of the force, and which, by being driven deeper than the lateral parts (*b* and *c*), is likely to carry down splinters from the inner table of one or both these portions: it is because the skull consists of two tables, and not by the peculiar fragility (though it is more fragile) of the inner table, that points, and spiculæ of it are so apt to be driven into the brain: when the pointed portion (*d*) is driven below the level of the contiguous parts (*b* and *c*), it leaves behind it the outer table of each of these portions, but it passes the inner table, and, as it is driven inwards, every inequality, or angle of the fracture, makes a resistance by which splinters are not only carried before the point (*d*), but driven vertically, like pins or sharp wedges, through the dura mater. The experienced surgeon distinguishes at a glance the forms of fracture in which there is danger of this kind: and, in a fracture of the form here described, *radiated, pointed, and depressed*, as there is no room betwixt fragments lapped over each other, like fingers when plaited and squeezed together, to admit a lever, I think it right to apply the trepan at the angle (*e*), (as usually there is such an angle in every fracture of this species), through which the lever, being introduced under the depressed points, raises them, and the probe, being turned round within the skull, will ascertain whether any rough edges still present, or whether any spiculæ or dangerous points stick in the membrane.

*Sixthly*, Fractures of this form may prove dangerous, but depressions of the kind which I am next to describe must be so. The form of depression which happens when a man is thrown from a stumbling horse, and pitches with his head directly against a stone; or when he falls from a yard-arm, for example, and pitches upon the deck; or when a block and tackle, or a corner-stone from a building, falls directly upon his head. This fracture is described by the ancients under the title of *Camera-*



*tio*, the cambered fracture, as resembling the inverted tiles of a house ; that centre is depressed in a direct line, the sides decline towards that centre, like the form which the two hands make when laid together edgeways. The form of this peculiar fracture has been but too minutely described ; while its character has been less an object of attention, though, from its very form, these inferences are plain : First, that in consequence of its great extent, both lengthways and from side to side, the oppression of the brain, if such an effect could be produced by depression of the scull, should be most manifest ; yet I affirm, from experience, that such effect is rarely felt, and shall prove, at the least, that oppression of the brain is not inseparable from this kind of depression : Secondly, it follows that from the depth to which the central line, or direct fracture, is depressed, there must invariably be presented two rough and very dangerous edges, which, by irritating the dura mater, will cause supuration : Thirdly, that though the patient should escape this danger, the circular fracture or crack which surrounds the whole, and which must invariably accompany depression of this form, (without which indeed the bone, in an adult at least, could not yield), must almost always insulate the depressed pieces, they must in nine of ten cases become carious, and to prevent these manifest dangers, I imagine it to be clearly the duty of the surgeon to elevate and pick them away, by pressing in his lever betwixt the edges of fissures usually very wide ; or this being either impracticable, on account of the wedge-like impaction of the depressed portions, or dangerous from the dipping of one end of so long and broad a fracture, while the other is rising, he should apply the crowns of the trepan successively, till the bone can be raised without being turned in upon the brain.

The case which I have selected for illustrating this principle, is that of an old man, of the name of Thompson, who might have been saved by a timely operation, but who was lost by delay. He had fallen headlong down a precipice, (the Calton), fractured his scull, had a double depression in the very course of the great longitudinal sinus, and of the falx, which, if any thing could oppress the brain and disorder its circulation, should have produced that effect : but so slightly was he affected, that nineteen days elapsed without himself feeling, or his friends suggesting, the propriety of procuring assistance. At the end of twenty days, this was his condition : the depression was manifest to the touch and to the eye ; the whole extent of the bone was black and bare, and a pale granulated fungus surrounded it : he had never, from the moment of the accident, had one

hour of sickness, or vertigo, or any considerable pain, but, on the twentieth, began to lose his appetite, became drowsy when undisturbed, and languid when forced to speak or move ; his pulse was rapid and small, his nights were passed in confusion. On the twenty-second day, he complained of more than usual pain, of slight vertigo, and of nausea ; and these symptoms succeeding a night of confusion and delirium, in which he struggled often to get out of bed, made it necessary to perform straightway an operation so obviously necessary, which had indeed been resolved on, and delayed only by necessary arrangements. The crown of the trepan was applied twice, and through each perforation the lever was introduced, and the bone poised up, but could not be safely moved till the third perforation set it quite free, when all the blackened bone was taken away.

But long before the operation was performed, the fatal inflammation had begun ; so it appeared from the depth and extent of the fatal abscess, which had indeed destroyed one entire hemisphere of the brain. Hitherto his state might rather be described by the term drowsiness than stupor : but the delirium of the night preceding the operation was a decisive and fatal sign. This delirium never ceased : in the present, as in all cases that I have watched, the symptoms were aggravated during the night : in suppuration of the brain, every long slumber is followed by a degree of delirium, and the fate of a patient, whose condition cannot be suspected from any symptoms occurring during the day, may be prognosticated from the confusion in which he passes the night. Through the night following the operation, our patient started up frequently, struggled to get out of bed, talked incoherently, but the return of light restored his senses, and during the day he was rational and composed, but still he slumbered. This was his condition during the nine days that he survived the operation : his pulse was a hundred and twelve, weak and variable ; he was restless and confused during the day, especially after slumbering, and was delirious during the night : from the opening in the scull, there was a considerable oozing of blood and of bloody serum. The third and fourth nights after the operation, were less perturbed : during the fifth and sixth, he was extremely restless and agitated, speaking much, and struggling to get out of bed : the dura mater appeared now black and sloughing, with a fetid, thin, and bloody discharge. On the seventh, he became comatose ; his cheek had a circumscribed and hectic flush ; his pulse beat 120, there was no more delirium, he lay insensible, and passed his urine and fæces unconsciously : on the sixth, seventh, and eighth days, the coma became deeper ; he lay still, and muttering ; and, after slight convulsive rigors, expired, on the ninth day after the

operation, the twenty-eighth from the time of his fall. In describing deep suppuration of the brain, to speak of the laxavities and draughts that are administered, or of their effects, were a very trivial detail.

Upon dissection, the whole of the right hemisphere of the brain was found in a state of suppuration; the basis of the abscess was very large; the opening through the dura mater, was like that made by a large abscess lancet, into the sac of any great tumour: the medullary substance of the brain was soft and gelatinous; the part immediately surrounding the abscess was gangrenous, marked by a black or leaden colour, extending an inch or more round every part of the abscess, and terminating in a disk or halos of a deep green colour: the left hemisphere was also, in a degree, tainted with the same colours, and slightly ulcerated on its surfaces.

*Seventhly.* Punctured fracture is that form of wound in the bone which has the same relation to these wide fractures and broad depressions, that the stab of a bayonet has to the cut of a sabre: plainly and indisputably requires the trepan, for in no case can we divine how deep the point may have gone; how far the ball, weapon, or point, may have sunk into the brain; in what degree or form the bone, especially its inner table, may be fractured: blood is often extravasated, and often spiculæ stick in the dura mater, or in the sinuses: the present injuries are sufficient motives for applying the trepan, and caries is, in this form of fracture, almost inevitable. I hold it to be the duty of the surgeon in all such fractures to use the trepan; to place the centre-pin of his instrument as close by the centre of the fracture as its irregularities will allow; and to operate with a crown so large as to cover all the fracture, and cut it out at once.

Such cases remind me of the necessity of establishing this as a rule "that all punctured fractures should be trepanned," and of enumerating the general accidents by which they are produced.\* When a man falls backwards against the sharp corner

\* The melancholy consequences of such a fracture, are admirably depicted in the following singular case, where the fracture was so minute that, had the integuments been fully opened, it might have escaped investigation; and yet the cutting out of such punctured piece of bone early, could alone have saved the boy's life.

----- Brand, aged about 14, was struck on the temple by a pair of scissors flung at him, the point of which stuck a little above the external canthus of his eye, till it was pulled out. A bit of sugar tied on the wound by his mother stopped the blood. He complained little for two or three days; but the pain gradually increased every day after. However, he went about till the eighth day, when he fell into convulsions, and I was sent for.---There was a hard tumour under the pericranium and crotaphite muscle, so tense, that a fluctuation in it could with difficulty be perceived. The tumour lay so exactly under the artery, that it could not be laid fully open without wounding the artery. To prevent an hæmorrhage,



of a stove or grate ; when, by the bursting of a fowling-piece, either the fragments of the gun-barrel, or the breech-pin enter into the forehead ; when, by a blow from a hammer, from the keys of a crane swinging and hitting the head ; when, by the blow of a sharp-pointed stone, making a radiated wound of the skull, depressed in the centre ; when a splinter from a carro-nade, or bolts, nails, or other fragments of iron have, in a sea engagement, penetrated the skull ; when a musket-ball, a dagger's point, or the point of a pike or bayonet, sticks in it—the fractured bone, and the fragment of the weapon or the ball, must be cut out with the trepan, else, slightly as the patient feels the wound, he will, by the inflaming of the bone and the suppuration of the dura mater, be irrecoverably lost, before the symptoms indicate danger. These are almost the only fractures in which I think the largest sized trepan should be used.

Shocking as the accident was, which I am now going to relate, I hardly ever saw a punctured fracture that I would so willingly have left to nature as that which happened to Billy Cameron, a boy of about twelve years of age. He was occupied a whole morning with his little play-fellows, in swinging upon an area door : the staple was loose : the insecurity of the door made a part of the pleasure they had in swinging upon it. When it came round to this little boy's turn, the stone in which the staple was socketed, gave way ; the gate of cast iron, the corner-stone, and the boy, tumbled all at once into the area : a good woman ran out instantly to lift the boy, and found him lying with his head pinned to the ground, betwixt two iron spikes, one of which had grazed and wounded the left side of the head, while another had pierced the skull, and was sticking in the parietal bone, the weight of the gate and the stone lying above him. She carried him in her arms into her house, where he lay without a sigh or a struggle, cold, pale, and death-like, for ten minutes : he then began to draw long breaths, to groan, and to open his

therefore, I cut the artery and all through to the bone with a bistoury. About half an ounce of well-conditioned pus rushed out, by which he was greatly relieved.—When I thought enough of blood had been discharged, it was easily stopped by a dry dofil and a halfpenny in the compress.—Next day he was brought to town ; and Dr. Gilchrist ordered such internal medicines as were judged proper for him, and he continued easier for two or three days. After which the violent head-ach and vomiting returned and lasted two or three days more, when a large quantity of matter burst out from within the skull, which again gave some ease.—But, though the orifice in the integuments was enlarged, no further discharge could be procured. He died in a day or two after, being the sixteenth day after the accident.—On opening his head, half a pound of pus was found in the brain, and the hole in the skull made by the scissors would not admit the point of a pin.—His friends absolutely refused the trepan, by which he probably might have been saved. His death, however, was of use to others, who more readily submitted to the operation, upon seeing the fatal consequences of neglecting it in his case.



eyes ; when his elder brother passing, and hearing of the nature of the accident, went into the house from a common impulse of humanity, and found his little brother in this mangled condition. He called a sedan chair, and placing him on his knee on pillows, brought him to the Infirmary.

By the time his father and mother had arrived, he was quite collected, and in his senses, he was sitting up, while his head was shaved, his mother took him upon her knee, and soothed him ; he laid down his head upon her bosom, and cried : but he wiped away the blood carefully and nicely with his handkerchief ; was perfectly collected and obedient, and neither cried nor struggled. The wounds were, one upon the left side, slight and superficial, from the grazing of one of the spikes ; another in the right temple, or rather about the centre of the parietal bone, very deep. The punctured wound of the integuments admitted a probe, which, passing obliquely backwards, encountered the edge of a deep depressed fracture : the iron point had not directly pierced the skull, but crushed and burst through the bone obliquely, and, by a lateral pressure, it had so bent down a piece of the skull, that the fracture was long and the depression broad ; but the integuments were only slightly wounded, they were punctured, and not torn. The boy was in his perfect senses, without even that tremor or agitation which such an accident might occasion ; no weakness of one side ; no stupor ; no vomiting ; no dilatation of the pupil ; no slowness nor pausing of the pulse, such as usually accompanies effusion of blood. I was averse from the proposal of opening the integuments, and ventured to prognosticate the worst consequences if a fracture, already so extensive, was trepanned, and the bones torn away : but the boy, though there was not the shadow of an ill symptom, was trepanned ; a long incision was made : two pieces of bone, each half an inch broad and an inch long, were twisted and pulled away ; two smaller fragments were loosened and pulled away by the help of the levator and forceps : all, in short, that was depressed, was disengaged and separated ; and the boy, whose condition was after the accident doubtful, lay now in a most perilous state : the integuments cut up to the extent of three inches ; the skull opened to the same extent ; the dura mater left to sustain alone the force of the arterial pulsations, the brain already protruding, even while the dura mater was still entire. I never, in boys, find the dura mater capable of supporting itself ; wherever the openings are thus wide, it inflames, sloughs, gives way at one or more points, and the PROPER SUBSTANCE OF THE BRAIN, previously suppurated, and ready to form a fungus, protrudes : so it was in this case.

“ Upon examination, after death, it was found that the

chief disorder lay in the right hemisphere of the brain, though it was in part communicated to the left. The left ventricle was somewhat enlarged, its surface irregular and soft, with suppuration, while a dirty greenish-coloured pus lined the walls: the inflammation, thus communicated to the left side, was universally diffused: the substance of the brain, in its anterior part, remained natural; the cortical and medullary parts were distinguished by the usual colours and forms, but the substance of the brain, where it approaches either inflamed surface, viz. that of the ventricle, or of the hemisphere, assumes a dirty olive green colour, which muddy and dusky green is the prevailing colour of the inflamed or half-gangrened parts. Immediately opposite to the wide opening of the skull, all distinction of the medullary and cineritious substance ceases; the brain has degenerated into a confused mass, which may be represented, in a drawing or a model, by a ground of olive green touched with spots of vermilion, like extravasated blood. The dura mater covering the right hemisphere of the brain, was much thickened, and leathery-like; its vessels conspicuous, red, and turgid, and coated with a tenacious coat of pus, greatly resembling, and in some degree partaking of the nature of coagulable lymph; but there was much unequivocal pus spread over all the hemisphere, reaching even to the basis of the skull. The dura mater was perforated, but not round the margin of the circle made by the trepan, as if wounded by the teeth of the instrument; the openings were round and central in regard to the naked part of the membrane, and were filled by the protruding parts of a fungus. The most difficult and interesting part of the anatomical inquiry was that which related to the state and origin of this fungus: it proceeded apparently from the membranes of the brain, from the pia mater; it was elongated from the surface of the brain in the form of threads, the remains, I presume, of vessels which gave consistence and strength to what in other respects resembled mucus."

*Eighthly.* One principle, relating occasionally to every form of fracture; to the depressed; the angular and fractured wound of the skull; the mere rima or fissure; nay, even to the slightest bruise of a bone, is this—that every such fracture is apt to become CARIOUS. When, by carelessness or design, a fracture has been quite neglected, or imprudently treated; when, along with a fracture or fissure, the skull has been grinded and bruised by a carriage-wheel, or grazed and deadened by a musket-ball; when the wound and the exposed bone has been much neglected or much tormented, by the ignorant surgeon, the fractured part becomes carious; when the wound becomes pale and flabby, the bone still seeming to the touch of the probe bare and

rough, or in part exposed, yellow, duskish, or inclined to blackness; when the patient sickens and becomes languid, with a furred tongue, a hot skin, and a febrile pulse, and a chorded feeling within the head—let the surgeon no longer show his humanity or skill, by watching his patient, but make haste to perforate the scull; if he perforate early, he will find but a little cream-coloured pus upon the dura mater, which will granulate and re-unite with the inner surface of the scull; but if he wait but three days, the ulceration will affect the brain.

Let this, qualified with such exceptions as your own good sense and experience may suggest, be your rule of practice. It is not by neglecting depression, which never is in itself hurtful, but by disregarding a carious bone, and the slight but mortal signs of internal suppuration, that many patients are lost.

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## DISCOURSE XX.

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### ON THE STATES OF CONCUSSION AND COMPRESSION OF THE BRAIN; WITH EXAMPLES NARRATIVE AND DESCRIPTIVE.

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#### SECTION I.

##### *Preliminary Observations.*

**T**O treat fractures, wounds, and other open and manifest injuries of the scull, prudently and skilfully, may be thought difficult; but how to reason concerning those internal injuries which are hidden from the senses, and marked only by variable and uncertain signs, must ever be perplexing. Perhaps there is nothing more generally desired by the profession than some decisive marks, denoting the particular nature of that stupor in which a patient lies oppressed after a fall or a heavy obtuse blow. But there is no such sign; we are doomed to proceed in our profession always with a degree of uncertainty, and to re-

gulate our conduct by a perpetual and attentive exercise of our judgment and senses. It is only by a deliberate and calm review of the circumstances attending concussion, that we can arrive at any thing like a conclusion.

To reason upon the cause of every phenomenon in the living body, is natural and unavoidable, and does by no means contribute either to multiply or confirm whatever prejudices we may have : it is only from refusing to reason that our worst prejudices have arisen : and prejudices of ignorance are infinitely more dangerous than the prejudices of those who, being willing to reason, are of course open to conviction, and inclined to enter into the discussion of whatever new views or unobserved phenomena are brought to light. Nothing perhaps can be more unmeaning than the word *Concussion*, which is not, in the common acceptation, accompanied with any conviction of the structure of the brain being disordered by the shock, the term implies a belief that the affection is of the nature usually denominated *Nervous* ! that it is inscrutable in its nature ! that, as we know nothing of the immediate cause, we can do nothing to recover our patient ! that whatever phenomena we observe, are such as are usually designated signs of debility ; and from this persuasion, and an indistinct and confused analogy, (as Mr. Abernethy observes) *betwixt fainting and concussion, stimulants and wine*, the most dangerous of all medicines, are poured down.

If concussion be indeed this inscrutable nervous affection, unattended with physical disorder, we must become mere spectators ; there is an end of reasoning, and in such uncertainty it were better to refrain from practice. But, the comparing the brain with other parts and organs of the body, will bring to our recollection many consolatory circumstances, which will encourage you to believe, that here also our profession may be useful. What does a bruise, a shock, and a general injury, do to a limb ? Does it produce any sort of disorder in a limb, which it may not produce in the more delicate substance of the brain ? When a man is hurt by the oblique blow of a cannon-ball, or has his thigh bruised by riding furiously against a carriage, by a fall, or by a log of wood, a block of stone, or any heavy body falling upon him, what does he feel ? nothing but numbness : the part is torpid ; he hardly knows how much he is hurt ; he is lame ; and we can hardly believe that any internal or physical disorder has taken place so suddenly ! yet before he is recovered from his confusion, or is able to mount his horse, the limb is stiff and swelled ; the swelling increases every moment ; the suffusion of blood, under the transparent skin, shows, by the speedy discolouring of the part, that the swelling, (too sud-



den to proceed from increased vascular action) proceeds truly from blood extravasated by the ruptured vessels, and there is no reason to doubt that the swelling in the deeper parts is from the same cause: the vessels of the limb have given way in many parts; its cellular substance is choaked with blood: if the suffusion be so universal and so great as to suffocate the arterial action, the limb never recovers, all living action stops, it gangrenes and dies: if the blood be injected in such a degree as to create only pain and disorder, the arterial action is rather excited, and heat, pain, redness, and suppurative inflammation, take place: if the blood be less generally injected into the limb, it is more easily absorbed, and the swelling is resolved without redness or pain. Of this suite of phenomena I must needs remind you, before proceeding, to observe in what degree these appearances take place in shocks or blows upon the head, and in what degree they are likely to affect the functions of the brain.

## SECTION II.

*Of Concussion.*

The patient who has fallen from a great height, and lies insensible from the shock, has sustained the principal injury in that system of vessels which, from all that I have related to you, is the most delicate, and the most susceptible of extravasation. Nor is there any mark wanting of extravasation, slighter or greater, general or local, having taken place in the brain: nervous affection (if we are still to use this unmeaning term) might, for a moment, confound the functions of the brain, as a man is not only stunned, but sickened by a blow of the fist; but the patient, who has suffered a concussion, lies insensible, snoring, and with his senses oppressed, and is in a state resembling that of apoplexy or intoxication; his forehead is swelled, his eyes often closed, and his features deformed with extravasated blood; blood gushes at once from his nostrils, mouth, and eyes; his pulse is slow and pausing; his limbs and joints loose and relaxed; the pupils of his eyes dilated; his breathing slow; his whole body cold; you hardly know that he is alive, but by his groans. If blood has thus burst from every part of this system of vessels, is it likely that the brain has escaped? If the blood-vessels of the nostrils, of the throat, of the ears, have burst from the shock, and blood is also effused under the skin, is it likely that the delicate substance of the brain should escape the same degree of suffusion? It is indeed true that, when the patient dies, and his brain is dissected in that coarse and

slovenly manner, which is but too common, and by boys who hardly know its natural colour and forms, it seems as if nothing had happened to account for the sudden death of the patient; and it is confidently reported so, because there is no fracture of the scull, nor any conspicuous effusion of blood: but when a brain thus deranged is dissected by a master who, by judging what is likely to happen, knows what to look for; the phenomena, though little perceptible to an ignorant man, must be interesting to a thinking observer.

"A man" (says Mr. Abernethy) "having fallen from the roof of a brew-house, a height of at least eighty feet, had his fall broken by touching the ground first with his wrist, which was dislocated and mangled; his forehead next struck the ground, and his face was bruised, but his cranium was uninjured: he lay at first almost inanimate, cold, and with a feeble pulse: when he became warm, he had stertorous breathing, a dilated pupil, and a profuse perspiration; his pulse rose to 140, he recovered a degree of sensibility, his pupil contracted, and his eye-brows were drawn into a frown; but his pulse again subsided; the animal functions gradually failed; he died the following day;" and his head was dissected by Mr. Abernethy, who reports the state of the brain in these words: "On dissection, there appeared every mark denoting violent inflammation of the brain and pia mater, of short duration. The minute arteries of the pia mater were turgid with blood; in many places THERE WAS THE APPEARANCE CALLED BLOOD-SHOT, which was also to be seen in the lining of the ventricles. Dark-coloured, and in some places bloody coagulable lymph, filled all the recesses between the tunica arachnoidea and pia mater. On dividing the substance of the brain, ALL ITS VESSELS APPEARED AS IF INJECTED WITH BLOOD."\*

Every word of this report, (more impartial than any I could relate on my own authority,) conveys the idea of turgescence of vessels, and general cellular effusion, throughout the whole substance of the brain, and makes good the parallel betwixt that state designated by the term Concussion of the Brain, and the benumbed and torpid condition of a limb whose arteries are burst and cellular substance suffused by a blow: it is not possible to imagine circumstances more suited to support the parallel than that suite of phenomena which takes place in concussion. The patient who has fallen from a great height, or otherwise suffered that shock which so deeply affects the functions of the brain, is found, when lifted from the ground, cold, pale, mo-

\* There is a preparation in the museum of St. Thomas' Hospital of a brain with a laceration in one of its hemispheres from a fall, which the subject, from whom it was taken, received, S.

tionless, without pulse, without sense, and is as in a fainting fit; if he continues cold, and passes his urine and fæces involuntarily, he dies. The first signs of returning life are deep and oppressed groans, the cold sweat breaking on his temples, and a fluttering motion in the pulses: when laid in bed, when warmed and restored to life, the groans become more frequent, he seems deeply oppressed, he tosses his limbs from time to time; his face is flushed, his nostrils dilated, his breathing laborious and noisy, his pulse slow and heavy, and has all the symptoms of deep apoplexy: by the second day his pulse has risen to 120; his lips are parched, his skin dry, his eye more open; he stares widely, but is insensible; and being roused, he, after a short and confused struggle, and muttering, as in low delirium, falls down again into a heavy slumber, from which, if bled and purged profusely, and his head bathed with cold vinegar, the surgeon having the good sense to refrain from giving opium or wine, he gradually recovers. It would appear, from this series of symptoms, that whatever general effusion takes place in the moment of the shock, is slowly absorbed; and that the febrile inflammatory action, which such a state of the sensorium excites, in the days immediately succeeding the fall, is harmless: yet not unfrequently there is a true Typhomania; the pulse rises higher, and throbs powerfully; and the patient, after long tossing and oppression, starts from his bed, strikes and struggles with his attendants, and subsides again into a state of torpor; but by profuse evacuations, and bold prescriptions, escapes the danger of an inflamed brain, though the action sometimes terminates in continued insanity, followed by imbecility.

These successive states, first of coldness and stillness in all the vital actions, with oppressed brain, and next of high arterial action, accompanied with delirium, have always struck me, as intimating strongly the parallel (so natural in every other point of view) betwixt a *contusion* of a limb, or of any other organ of the body, and *concussion* of the brain: nor am I over anxious, when I find my patient quite insensible, lying in a state of stupor, resembling intoxication, if that first stupor be followed by arterial action and the signs of inflammation, for then I know the oppression is from no local cause: nor am I alarmed when he becomes delirious, for that is a state little more than febrile, which I have usually observed to be a sure forerunner of recovery; there is in such case nothing essentially to oppress the vital functions, or to cause death.

*In this parallel between numbness and concussion does Mr. Bell pretend to say that because small arteries are ruptured that such rupture is the cause of numbness or concussion? surely not. Rupture of the arteries is only a concomitant with the nervous affection.*



## SECTION III.

*Of Compression.*

When, in place of general suffusion and disordered circulation, some greater vessel has given way, and either under the dura mater, or in the substance of the brain, there is a particular effusion of blood, the scene is very different from that now described: the patient, oppressed by an effusion of blood, is never insensible, (unless he is about to expire) and rarely delirious; his pulse never rises, but is slow, heavy, and pausing at every fifth stroke; his pupil is sometimes dilated; one side usually paralysed, or at least still and motionless, while the other often shakes with a sort of tremulous convulsion, which returns at regular intervals, and is attended with a quivering and irregular pulse, cold extremities, and insensible evacuations, when he is about to expire.

Extravasation more frequently arises from a blow or fall upon a hard body, and is more connected with fracture of the skull than concussion, which arises rather from a shock than a blow: extravasation is more of the nature of a local injury: the patient, when raised up, is cold, pale, and motionless, but to this no usual heat ensues; he tosses as under some oppressive feeling, and often lifts his hand towards the injured side of the head; he lies with his eyes shut, groans as from oppression, but is always sensible; stares at you when roused; answers whatever questions you ask rationally, but in monosyllables; he seems impatient when teased with questions; his answers are pronounced with a sigh or a groan; he is correct in answering to the circumstances of his fall, even to the nature of the oppression he suffers, and to the part of his head that is pained, towards which he moves his hand, though irregularly, whenever he is desired: in his tossing he sometimes rises upon his elbow; when requested to rise, he sits up, and takes the drink which he calls for, but soon sinks down again into a slumber, more like sleep than apoplexy, and tosses and groans more as his sleep becomes deeper: the oppression and tossing are inseparable from this condition of the sensorium, and the pulse is slow, pausing, beating no more than fifty in a minute, and interrupted at every fifth or sixth stroke, especially while the patient is lying in deeper slumber, or when in particular danger. I believe I have rarely seen a patient, to whom an operation or any kind of assistance could be useful, quite insensible from mere oppression of extravasated blood; and of this I am very sure, that I have innumerable times seen the patient whose extravasation



was so great as to prove fatal, such as was found upon dissection to cover one entire hemisphere of the brain, retain his perfect senses, and recollect minutely the circumstances of his fall, with a consciousness all along of every thing that was said or done about him.

I have just described a condition which, I would fain flatter myself, can hardly be mistaken, which at least is not likely to be confounded with the total stupor of concussion. **IN THE FIRST DEGREE OF EXTRAVASATION**, the person lying oppressed with extravasated blood, is not insensible, but tosses and groans from oppression, replies when spoken to, feels giddy, and, when able to express his feelings, says that every thing seems to turn round; he pukes from time to time, and has a slow, heavy, and pausing pulse: if you add to these signs, that, in his tossing, you perceive that one leg or arm still moves, while the opposite arm and leg lie almost still and motionless, you will seldom be deceived; and finding these symptoms to continue for days, the oppression to become deeper, the vomiting to cease, and the pulse to decline in strength, becoming slower as it becomes feeble, it is your duty to apply the trepan, and often you are successful. These are the signs of slighter extravasation, which yet, without the assistance of the surgeon, becomes desperate: for, in a few days, the side opposite to that which received the blow becomes manifestly paralytic; and as the extravasation and oppression of the sensorium increase, the palsy is followed by convulsion; while the one side becomes paralytic, the other is seized with slight tremors, and soon after the pulse becomes weaker, though it can hardly become slower, the natural heat declines, the patient expires: wherever such convulsion accompanies the palsy, it is too late to operate.

**IN THE SECOND DEGREE OF EXTRAVASATION**, when the patient is paralytic, or completely oppressed, from the first moment, and there is no perceptible interval betwixt the paralysis of one side and declining of the vital powers; when he lies oppressed and moaning, raises his hand frequently towards his head, but is not deeply insensible, nor has the pupil much dilated; if he speaks, when teased, though slowly and difficultly, and then in a particular manner raises his hand to his head, the evidence of extravasation is complete, the patient is in the utmost danger, the operation should immediately be had recourse to, and perforating with a large trepan, and giving vent to the coagulated blood, which rolls out thick and black, sometimes relieves the palsy, restores the senses, and finally saves the patient's life.

But there is **A THIRD DEGREE OF EXTRAVASATION**, invariably fatal; and I believe the symptoms I am now to describe

indicate in general, that extravasation which either expands itself over the lower parts of the brain, or extends from the upper parts to the basis of the scull, raising the nerves from their origins, and distending them betwixt the basis of the brain and the foramina through which they pass out. The condition I have here to describe is that of total insensibility and grinning convulsion; an insensibility unaccompanied by stertor or snoring, but, on the contrary, with a pale face, cold extremities, and a fluttering pulse; a convulsion agitating not one side, but chiefly affecting the features of the face, jerking the head back, and stiffening the neck: the convulsion resembles that of the locked jaw; and it is very distracting to look upon such a patient, for the symptom brings an absolute conviction to the mind of the spectator that the disorder is fatal.

The patient's condition may be thus characterised; he is taken up cold, insensible, with a dilated pupil, and hardly any signs of life, and recovers heat very slowly and imperfectly: after lying oppressed, groaning, deadly pale, with a dilated pupil, the extremities cold, and the eye-lid remaining raised as you open it, unless you lay it down again, he begins on the second day to be affected with convulsive twitches; the cheek is particularly distorted, the whole body is still and cold; the convulsion increases in violence, and returns with a degree of regularity every ten minutes or quarter of an hour: at each return of the convulsion he continues, while you can count two hundred or more, to have the cheek and corner of the mouth raised, the eye-brow and all the features of that side violently distorted, with spasmodic twitches, the neck rigid, the head jerked violently round and bent backwards upon the neck, with interrupted strokes; and each convulsive twitch is accompanied with a catch of the respiration, a distortion of the mouth, and with a noise of *hick! hick!* repeated at each twitch, while the convulsion lasts. It seldom continues long: on the third or fourth day the convulsions grow weaker; the extremities and the whole body become cold; the pulse, which is not at all to be felt during the convulsion, trembles during the intervals, and the patient expires.

These two states of CONCUSSION and COMPRESSION bear a strong analogy with the relative states of APOPLEXY and PALSY. CONCUSSION, there is every reason to believe, is not a mere nervous affection, else it could not be permanent, but a suffusion into the substance of the brain, resembling the ecchymosis or bloody suffusion of a bruised limb, attended with symptoms resembling APOPLEXY, and terminating usually in a gradual absorption and slow recovery; sometimes in high inflammatory action and sudden delirium, in Typhomania, or rather that al-

ternation of Delirium and Coma, which is almost inseparable from such a state of the sensorium : while COMPRESSION, proceeding from extravasation of blood, is plainly PALSY ; beginning in stupor, without insensibility, and ending in Hemiplegia and convulsions ; but, with this special distinction, that Palsy, proceeding from rupture of vessels overcharged by the *apoplectic arterial action*, is a disease of the brain itself, is attended with destruction of the cerebral substance, and is thence incurable ; while the Paralytic State, proceeding from a shock or blow, consists in extravasation, foreign to the substance of the brain, external even to the dura mater ; is merely a local compression, not directly injurious to the cerebral substance, and thence is curable : the moment the extravasation is let out, the patient raises his eyes, knows his friends, and moves the affected side. . The truth or probability of these parallels will best appear from narratives of such accidents as you are likely to meet with in practice.

Being called to Hamilton, to visit a gentleman, an officer in the 7th Dragoons, who was supposed to have a fracture of the scull ; I found that, in riding a wild horse, in the court-yard of the barracks, unaccustomed to the heavy bit of the cavalry equipage, he had checked his horse in rearing, and pulled him back, and the horse falling upon him, he was knocked down and struck to the ground with great violence, his occiput encountering the hard beaten gravel : he lay pale, pulseless, and insensible, was restored to heat very slowly, and continued in a profound stupor, snoring and motionless. I arrived the following day, and found him still insensible ; his pupil not dilated, his tongue furred, his hand hot and dry ; his pulse high, his face flushed ; his looks, when roused, wild and distracted ; he instantly, after being disturbed, fell down again into a state of stupor, and nothing could rouse him to any recollection of his situation, nor enable him to articulate even a monosyllable. Upon consulting with Mr. Taylor, the regimental surgeon, formerly of Mercer's Hospital, a man of the best education, and of strong good sense, we agreed, however unpromising his condition might appear to his friends, to report to Colonel Heul, that he was in no danger ; that we should make no incisions ; that, by profuse evacuations, this fever might be prevented from rising to delirium ; that, after slumbering a few days, he would gradually recover his senses. Presuming, from this infallible mark of quick pulse accompanying the stupor, that the stupor was void of danger, I left him with confidence ; and, by letters from Mr. Taylor, had the comfort to learn that, after slighter dawnings of sense and reason, he was, by bleeding and strong purges of calomel and jalap, perfectly restored, before the week had elapsed.



Concussion, in a greater or less degree, is almost inseparable from that kind of shock to which the head is exposed when a man is thrown from on horseback; sometimes it is accompanied with fracture or extravasation, and thence questions of great delicacy and difficulty often arise. The first head I ever dissected, after an accident of this nature, was that of a young gentleman, who having rode on a pleasure-party to Roslin, exceeded in wine, was ill able to manage his horse, was thrown, and died on the fourth day: but in his scull was found not the slightest trace of fracture, nor within, the slightest extravasation; nor could any peculiar appearances be remarked in examining the substance of the brain itself, except general redness of the pia mater, vessels extremely turgid, and many bloody points. Whence we perceive how narrowly those escape who have violent concussion; they invariably die, if the pulse continues low, or is at any time intermitting.

Another young gentleman, on his return from a like excursion, was thrown from his horse, lay in a death-like stupor for ten days, during which period the blood, which had at first gushed from his nose, mouth, and ears, continued to flow unremittingly from his right ear. The shock, which thus bursts the vessels on these delicate surfaces, cannot but have a like effect on the delicate cerebral substance within: the senses and intellect suffer from this suffused state of the brain, but the hæmorrhagy from these vessels probably saves the internal part of the system from any extreme violence; at all events, it is certainly observed, that such issue of blood from the mouth and nostrils, though a sign of great violence, is favourable to the patient's recovery; and if any such hæmorrhagy is dangerous, it is that from the ear, for there is little doubt that it must come from those internal vessels which traverse the ear: yet this young gentleman entirely recovered.

In such cases, wine and the heat of exercise, youth, and health and strength, prepare the vascular system but too well to assume an inflammatory action, and to re-act powerfully; thence it often happens that, in place of lying like these young men, torpid and oppressed, the patient bursts out of bed, struggles with the attendants with maniacal strength, and is very difficultly subdued, and in great danger of ultimate violence to the structure of the brain from such high and continued vascular action. This I saw conspicuously exemplified, in a young man, uncommonly athletic, accustomed to violent exercises, who, being thrown from his horse when riding extremely hard, not brutally intoxicated, but furious with wine, lay for five days in a state of profound stupor, from which he, after staring, struggling, and muttering, wakened to such a phrenzy that



four stout men with difficulty held him down in bed, and yet he recovered, and reformed, and now lives in perfect health.

These familiar examples, such as you will daily meet with in practice, cannot perhaps be more happily closed than with a short case from Jacotius; it stands recorded in his commentary on the third aphorism of the first book of Hippocrates. "We have observed" (says this author) "of those who have the brain injured, some dying suddenly, others lying oppressed and snoring, while others have blood issuing from the nose, ears, and mouth, and yet live: one patient of mine having lain speechless a long while, and apparently dying in convulsions, started suddenly from his bed, in the middle of the night, fell upon the attendants with maniacal fury, and felled every mother's son of them to the ground, except a Franciscan monk, a lusty able fellow, against whom he maintained a long battle, with feet, and hands, and talons: the monk called loudly for help to those who were already felled, but in vain; they lay strewed on the ground, while he struggled alone with the furious patient, who seized alternately clubs, fire-irons, piss-pots, whatever he could lay hands on; and laying hold at last of an iron stanchel, he tore it from the window with incredible strength: he had now nearly levelled the monk with his fellow-watchers, and would have beaten out his brains with a stone of forty pounds weight, which he lifted and aimed to throw at his head, when the monk, breathless and exhausted, but desperate, collected all his strength into one last effort, and gave him a kick on the cods, which brought him to the ground. This man, says Jacotius, I entirely cured." This example of horrible phrenitic delirium, I quote in proof of what I have constantly remarked, that delirium is the least unfavourable symptom and the most curable.

The more fatal accident of extravasation is attended with symptoms less terrible, and with a comparatively slight affection of the intellect and senses: I have been confounded often to see the patient recollected and sensible, under a compression so decisive as to cause paralysis of one side: SOMNOLENCY, not STUPOR, is truly the mark of this state.

John Hutchison, a sailor lad, of twenty years of age, fell down stairs, and lay in a state singularly characteristic of compression of the brain: his condition was described to me by a good woman, who was very careful of him from the moment of his fall, for he was the companion of her son, who had followed him to sea; when the one boy was gone abroad, the other would not stay at home. This lad, on a visit to his father, perfectly sober, going negligently up an outside stair, fell, but whether three steps, as a workman reports, or the whole flight, as this woman's husband believes, we could never certainly

learn: this good woman, who lived in the house under his father, was abroad at the time, but her husband heard the fall, so violent was the shock, and running out, carried him up stairs with the assistance of a mason who was working in the close. When she came home, she went up to him, and found him lying oppressed, as in a deep sleep; she asked him often what happened, and how he was, which he answered always in two or three words, passionately and impatiently pronounced, "that he was better," "that he would soon be well," "that he would lie and sleep a little," still he begged that they might let him lie still and sleep. His tongue sometimes faltered; he answered best when most roused; there was a cold sweat all over him; his face was exceedingly pale, he yawned perpetually, and always when offered drink, &c. cried, "let me lie and sleep:" he vomited frequently during the two first hours after the fall: his left side, his left arm at least, was plainly powerless, he never moved it in concert with the right: he lay in a slumbering condition, groaning and tossing as if oppressed; muttering, but always conscious of his condition; complaining of his head, and able to answer: when this good woman sat him up in bed, or when he raised himself to pass his urine, he complained often of his breast, and sometimes of his belly, but continually of his head: while quiet he had no snoring, and slept like a child, till after being bled by the surgeon of his ship, from which time he enjoyed no more of that placid sleep. On the third day, this woman brought him up a basin of warm milk, and he seemed to like it; she raised him in bed, he sat up and took the basin in his own hand, and when she gave it him, saying, take it my good lad, he answered, "I will, I will, but do not trust to my hand only;" yet, with her help, he held it to his head, and drank it off. He complained continually of his head; and in whatever way roused or disturbed, he begged they would let him sleep; "if they would let him sleep a little longer, he said he would go down to Leith and go on board."

This good woman went up to see him at seven in the morning of the fourth day; she found him still slumbering, and continually complaining of his head; suddenly he was seized with a strong convulsion, raised himself a little in bed, and thumped incessantly with his hand upon the side of the bed, striking with the paralytic arm as well with the sound, and all the while he kicked and struggled with his feet; at last his left hand was suddenly seized with a violent spasm, the wrist was strongly bent down towards the fore-arm, the fingers stood out rigid at right angles with the hand, and from that moment he never moved that arm more, his hand continuing rigid in this distorted form. But the convulsion did not then cease; it continued from seven

in the morning till eight: notwithstanding these terrible convulsions, and this spasmodic palsy of the left hand, he retained his senses, spoke sensibly when roused, supported himself in some degree in bed, complained sometimes of his belly and of his head; and when asked about the state of his bowels from the time of his fall, answered collectedly and correctly. This was on Thursday, the fourth day from the fall: on Friday morning, I saw him, for the first time; and in the evening by six o'clock he was dead.

"In the last day of his existence, he still retained his senses; he lay in a perpetual slumber, but had no puking; his tossing and anxieties were very distressing to see; his face was deadly pale, his right eye stood immoveable when opened, the pupil being widely dilated; while his left (though his left side was paralysed) remained irritable and moveable, the pupil of it was contracted, and it turned quickly from the light; his pulse was small, quick, and fluttering, like that of a sick child; and the vital motions so affected, that it appeared manifestly that they could not go on; his extremities were cold, and I judged him dying: but nothing surprised me more than to find, upon lifting his eye-lid, that I could rouse him to speak; when I bade him put out his tongue, he did so, and when I spake loud and impressively, and asked where his pain was, he raised his right hand, though in an irregular way, and laid it upon his head."

"This very stout young man expired about six o'clock on Friday evening; and the following evening we found, upon dissecting his head, no tumour, nor even a bloody effusion in the integuments, but in the cranium a large and wide fracture, traversing the parietal bone, and running through its whole length: unconnected with that, on the vertex, was a small fissure, penetrating only through the first table: under the centre of the parietal bone lay a very large coagulum of blood; it was as large as the whole hand, bating the points of the fore and mid fingers, and thicker than the fleshy part of the palm; it was very firmly congealed, and came off in one cake like the placenta of a fœtus, leaving a very deep depression in the brain, into which you might have laid the back of your hand."

It is not my intention to accumulate authorities for what I know to be a plain fact, but will go on to represent to you the condition of the patient while labouring under symptoms undoubtedly mortal.

"A very old man was carried into the hospital, who, after a fall, lay insensible and convulsed: no relations accompanied him to tell what had happened: two sons, who afterwards came, were at once brutal and perverse, seemingly indifferent to his sufferings, and yet sternly and impudently refusing to allow us



to proceed in the way that prudence and the necessities of the case required. He was a very old man, with bald temples, a naked scalp, and not the slightest appearance of injury on the head: he lay in a deep stupor, immoveable, except when agitated with a convulsion, which returned every ten minutes, and became more frequent as his strength declined; his eyes, which were closed during the interval of stupor, opened when the convulsion approached, and stood staring wide, with a much dilated pupil: first the cheek and features on the right side of the face were drawn up into a ludicrous grin; then the neck stiffened, the head was jerked backwards, and the jaws worked backwards and forwards with a violent spasm; the tongue and throat were also affected, and the lips made that kind of noise that follows when we draw the breath through the closed teeth, to prevent the saliva escaping by the angle of the mouth: after continuing two minutes or more, the convulsion terminated, with deep groans, in a state of stupor. His unnatural sons would not suffer us to touch one hair of his head; and on the evening of the second day, when he died, they came, with a mob of vagabonds at their heels, and carried away the body, with a degree of precipitation which inclined us to believe that there was something particular in the manner of this blow which they were afraid dissection might reveal."

Not a moment should be lost when such symptoms appear: the extravasation may be in the ventricles, on the basis, or within the substance of the brain; and if so, the man is gone beyond redemption; but if it be only on the surface, and there is a possibility of saving his life, it can be only by immediate operation: when the symptoms of extravasation are accompanied with fracture running downwards towards the basis of the skull, we may despair of doing good.\*

"A big and strong man, a common labourer, fell down three steps of a stair; but there was every reason to believe he had struck his head on the edge of a bucket, hitting that part where a projecting iron hinge joins the iron handle with the tub: when raised up, he was pale, cold, and pulseless; cordials were given him, he was restored to heat, and then blood was observed to distil from his nostrils and right ear. Being carried into his own house, he passed a disturbed and restless night, till towards morning that he enjoyed a calm sleep. He lay still and motionless the second day; his eyes seemed dead and glazed,

\* Whenever there is a fracture at the anterior and inferior angle of the parietal bone, accompanied with symptoms of compression, nothing but an immediate operation can probably save the life of the patient; because, should the principal meningeal artery be torn, as it frequently is under such circumstances, it pours out its blood with such force as to prove very quickly fatal. S.



the pupils of both were dilated, contracting only with the very strongest light; his jaws seemed clenched, his teeth closely shut, his lips retracted and turned backwards, uncovering the teeth as in grinning; he breathed slow and heavily through his nostrils; he was paralytic of his left side, had involuntary stools, and passed his urine in the bed.

“ Yet, upon being stirred and roused, he looked up wild and bewildered, and had frequently, during the night, attempted to get out of bed; his pulse was weak and fluttering, and his body cold; he was not so insensible but that a purge operated briskly, though then and always his stools passed unconsciously: his face was pale and shrunk; he lay but a few minutes in one posture; he then turned and struggled, and a sort of foam issued from betwixt his closed teeth, while his lips were retracted into a grin; his cheek was distorted, and his jaws worked perpetually, so that you heard his teeth grinding. He was permitted to lie too long in this desperate state unassisted. When my brother and I saw him together on the third day, the paleness of the face and coldness of the body had increased, the stools were involuntary, the pulse extremely feeble, almost imperceptible; we called immediately a consultation, rather to witness what was to be done, than to give advice in a case so plainly desperate: perceiving, though there was not the slightest swelling, a degree of livor on the temple, my brother made an incision, and, turning down a large angular flap of scalp and temporal muscle, uncovered the temporal bone down to the zygoma, and in doing so felt his knife grate against a rough and wide fracture; the flesh of the muscle being cleared away, a very rude fracture was seen to run horizontally through the parietal and temporal bones, its branches passed down under the zygoma to the basis of the scull, blood oozed through the chinks of it, and a large trepan being applied directly above the zygoma, very black grumous blood rolled out. He died in about fourteen hours.”

Your own good sense will suggest to you that, besides those decisive conditions of the intellect and bodily functions which I have endeavoured to characterize, there must be many intermediate states, extremely perplexing and difficult to resolve into any simple principle; in all things I wish to leave you to your own discretion; in many, I am sorry to say, you can have no precise rules from any teacher, but must trust to your own penetration and judgment: experience, or, in other words, the habit of reasoning, so as to infer from external signs the kind and degree of internal injury, will enable you to resolve the most anomalous symptoms; but that condition of the brain in which general suffusion of blood is followed by inflammation, delirium,

and death, that condition which is marked by convulsions and spasms resembling those of Hydrocephalus, and with a pulse indicating nothing of oppression, is of all the anomalous states of the organ the most frequent. I cannot remember that I was ever more perplexed how to act than in the following case.

“ A poor boy, of thirteen years of age, in scrambling with his play-fellows, on a Sunday afternoon, about the ruins of a house which workmen were pulling down, fell from one of the windows, a height of fourteen feet, and struck his forehead against a beam. There appeared upon the forehead, close to the root of the nose, a soft elastic tumour, and a general sugillation of blood, which entirely closed the eyes ; he was stunned, and lay in a death-like stupor for a quarter of an hour, but entirely recovered : he had been universally bruised, for he vomited blood, which also flowed in a full stream from his nose ; his pupil was contracted ; his pulse regular and strong, beating 90 in a minute. Next day the vomiting continued ; his pulse was still full and strong : upon being bled, the vomiting ceased, and the pulse subsided both in strength and frequency : the night he passed tolerably, though restless, feverish, and in pain ; he often carried his hand to his forehead, complained of the pain, and sometimes talked wildly through his sleep. The second night he passed in great confusion, with much delirium, and when most rational he complained grievously of his head, while a thin and bloody serum distilled from his right ear, with great pain behind the ear, where it would appear he had sustained a degree of injury, which might well happen in a fall so irregular among stones and beams. On the third day, the tumour of the forehead subsided, and the eye-lids opened : on pressing the tumid part of the forehead, he complained of intolerable pain ; his pulse continued high and rapid ; the bleeding, purges, leeches, and other sedatives, were renewed ; his sleep during the night of the third was more composed and natural, and he had no unfavourable change, till ten o'clock in the morning of the fourth day ; when he became very hot, feverish, and restless ; vomited much ; the vomiting was excited by repeating the cathartic, and even by taking the acidulated drinks which were ordered him ; at four in the afternoon he was seized with extraordinary contortions, and strong spasms of the abdominal muscles, with violent tremors of the whole body, and grinding of the teeth : his breathing was affected by the violence of the spasms in the abdominal muscles ; it was noisy and laborious, but not slow nor oppressed, and the pulse beat 120 in the minute : towards afternoon all parts of the body were at times convulsed ; he howled as if distracted with pain of the head, and his eyes squinted horribly ; he grinded his teeth continu-

ally, his features were distorted, his arms and fingers stiffened and crooked with cramps and spasms : his condition this day and evening reminded me of the condition of boys in the worst stage of acute hydrocephalus or inflamed brain. At ten at night, he had, after suffering thus violently all day, subsided into a sort of stupor, without vomiting, but with a rapid pulse.

“ The night of the fourth was restless and miserable, but much of it he passed in a state of stupor : on the fifth day the swelling of the forehead had entirely flattened ; that of the eye-lids was gone ; nothing remained to denote the place of injury, but the general sugillation of blood with which the forehead and eye-lids were discoloured : at five this evening I found him quite sensible, complaining of excruciating pain in the head, screaming with the torture, and his eyes horribly distorted, especially the right one, which was turned downwards and inwards till the iris was almost hidden under the inner angle of the eye. This night he had much delirium, and while conscious complained of pain of the head, especially behind the ear ; for though he felt pain of the forehead when pressed, he felt pain behind the ear and through the head at all times : he howled much this night from eleven o’clock, and his thighs were rigid and his toes crooked with the spasms.

“ On the sixth I found him dead ; he had raved the whole night long, had cried continually with the pain of his ear and forehead, was seized betwixt two and three in the morning with such universal spasm, squinting, and howling as he had on the afternoon of the third, and at six in the morning he expired.”

Here was no symptom of extravasation nor of compression ; none but of inflammation ; and against inflammation what could I have done by tearing the skull with the trepan ? It was not for want of those marks which are usually thought a vindication by those who are impatient to apply the trepan, that I refrained from using it, for I distinctly felt a fracture in the forehead, accompanied with a degree of depression in the place of the frontal sinus : but from a perfect consciousness that my operation could do nothing but increase the inflammation, and from a persuasion that the fracture was a concomitant merely of a more fatal disease : I reflected seriously, and found myself assured, from the symptoms, that inflammation was the principal disease ; that fracture at this point could be attended with no remarkable depression ; that if it was extensive, it must run through the basis of the skull ; and I had the satisfaction, melancholy though it was, of discovering, on dissecting the boy’s head, not the slightest extravasation upon the dura mater, but the surface of the brain universally reddened, and its vessels turgid, and there was a wide fracture, beginning at the orbi-

tary plate of the frontal bone, and running quite across the occipital bone into the foramen magnum ; but without any remarkable appearance either under the bruised part of the forehead or behind the ear.

I will no longer detain you, but hasten, after a short section on the mechanical part of your duty, on the operation of trepan, to lay down rules for your general conduct, not without a confidence that, among the variety of delineations of the disordered conditions of the brain, narrative or descriptive, which I have laid before you, you will be able to find rational parallels for a great proportion of the accidents which may overtake you in your future practice.



## SECTION IV.

*Of the Operation of Trepan.*

At the head of this little chapter, of instructions how to use the surgical instruments, I have placed those used by the mo-



dern surgeon :\* if you conceive, as I trust you do, the essential purposes of the operation, I have no fear of your using them with sufficient dexterity and address ; and my instructions on this head shall be few, plain, and simple.

The simple form of the modern instrument marked (A) turning in half circles with the hand, is found to perforate quick enough, and to be extremely manageable, since the saw is easily inclined so as to continue its semicircular incision on that segment or side of the perforation which is least cut. The forceps (B) take out the piece of bone, either by their circular lips (C) corresponding with the circle of the crown, being introduced into the circular cut to seize the sawed piece, or by the points (D) being introduced to poise it out. The lever (E) is sometimes useful in poisoning out the piece separated by the saw, but the point of it is too blunt and round to be very serviceable, in any but its proper office, which is to poise and raise up whatever depression of the skull requires to be elevated ; and the levator and the forceps are equally used in twisting or poisoning out loose pieces of the skull. These are the simple instruments now laid in the operating case ; along with which you are usually provided with a brush to clean the teeth of your saw ; a second head or crown, of the same diameter with the first, that while the one is blunted, or when it is unscrewed for the purpose of being cleaned, the other may be used ; a knife is also laid in the case, for dividing and raising up the scalp, and often a RUGINE or triangular instrument, like a caulker's iron, for scraping away the pericranium, which I never do, for I find it unnecessary, and do not think it right or safe.

1. *For the disposition of your Instruments and Dressings—* They are to be laid in two small plates, within a doubled table-napkin, the napkin being pinned so over the bottom of the plate that it may not shift, nor any awkward accident happen : on the first plate is deposited, within the folds of the napkin, the trephine, the centre-pin of the crown, the key to unscrew it with, the lever, the forceps, a tooth-pick, and a brush ; on the outside of the cloth is laid a knife and sponge, soaked and squeezed, so as to be ready for use. On the plate of dressings are to be laid, lint nicely folded into smaller and greater compresses, very soft ; a little square piece of oiled lint ; a broad compress of four or six folds of old linen ; a double-headed roller, three ells

\* I have added to Mr. Bell's figures, a representation of a saw, recommended by Mr. Hey, of Leeds. With this instrument, any particular point of bone may be cut out, and it has this very great advantage, that it enables you to remove no more of the bone than is absolutely necessary. It is useful on many other occasions for the removal of diseased bone : (it is here represented half its proper size.) S.

long, pinned at each end, so that when lifted, however hastily, it may not run down; and in the cloth that covers the plate should be stuck one or two needles of the smaller size, threaded with a double thread, waxed.

2. *For the Posture of your Patient*—If composed and sensible, and capable of sitting erect, you should place him on the ground, as a dentist places his patient: the assistant, who is to hold him, should have a board laid across his thighs, the patient's shoulders fixed between his knees, and the patient reclining his head upon a pillow laid upon the board; the assistant should lay his hands gently over the head so as to steady it, and in such a manner as to use, without change of posture, greater exertions, if required: where the patient lies insensible, he should be moved towards the side, or towards the head of the bed; his head laid on a pillow, steadied by a board under it; unless the couch on which the patient chances to be laid, is sufficiently firm: a bed never is.

3. *In cutting the Integuments*—The first step of your operation, you lift from the outer cover the knife and the sponge; the sponge, small and compressible, you hold in the palm of your left hand, under the ring and little fingers; you lay the mid-finger, fore-finger, and thumb of the left hand broad upon the scalp; you feel with the point of the left fore-finger, and by it guide your knife through all parts of the incision. *First*, If the scalp, having been once detached to a great extent, is reunited, but over a carious bone and suppurating brain, the hollow integuments admitting the probe to turn to a great extent over the diseased skull, you take, in place of the round edged scalpel, a blunt pointed bistoury, and running it along, you at one stroke disengage the flap of diseased integuments, and turning it down see the whole extent of the dry, yellow, and blackened bone: your perforation should be central in respect to such caries. *Second*, The scalp having risen in form of a puffy tumour over a contused part of the cranium, you make, with the round edged scalpel, not a crucial incision, for that makes four small angles in the scalp, the raising up one or more of which displays but little of the diseased bone, but an incision in a tripod-like form; then the three points being dissected away from the skull, make a very large opening, and even two only of the points being raised, they make, as being two thirds of a circle, a very free opening: here too the state of the skull marks the danger to the brain; but in place of being yellow, rough, or blackened, it is usually only dry, not shining, nor brilliantly white, not attached to the periosteum or integuments; sometimes it is spotted or tinged with yellow, and devoid of circulation, and does not bleed when scraped with the point of the

knife. *Third*, When, after a dreadful fall, the skull is cruelly fractured, pieces beaten in, and the fissures wide, circumspection is so natural, and you can so distinctly feel with the point of the left fore-finger those asperities and openings, through which your knife might plunge into the dura mater, that I need but to intimate the danger. But, *fourthly*, When from a desperate fall upon the steps of a stone stair-case for example, the patient lies in a deadly stupor, cold, pulseless, moaning, the integuments never rise into a tumour, nor become ecchymosed, except very slightly; they remain entirely flat for days, because the man is almost dead; the hemiplegia alone, with some slight blemish on the scalp, directs you on which side to operate, viz. the side opposite to that which is palsied, and from the convulsed or dying state of the patient you must do so quickly. The surgeon in such case, operating without a certain knowledge of the state of the skull, is in danger of plunging his knife unawares through a wide fracture. I have witnessed this disaster; let such incisions then be done carefully.

Allow me to add to these particulars a few general instructions. Do not seek to pursue the several limbs of a fracture, for to these your operation does in no shape relate; but seek the central point only, where the weapon or sharp stone has penetrated, or where the depressed angle is kept down by the firm and sound bone. Do not seek to scrape the bone, that you may trepan easily; I never, in amputation or in trepan, found the soft parts entangle the teeth of the saw: in trepanning, I only cut away that cellular substance into which the extravasated blood is strongly injected, sometimes solidly impacted, and no farther than to procure a distinct view of the fractured pieces. Do not lay pieces of lint on the integuments, entrusting them to awkward assistants to hold them back while you perforate; for it is the sensibility of the integuments that makes the patient cry, resist, and struggle, which at once impresses the spectators with horror, and brings the reproach of cruelty on the surgeon, who must complete his operation in the midst of such cries: if you would avoid this unseemly scene, use spathulas or flat plates of iron, such as Mr. Croker King calls defenders, to hold aside the integuments, and the perforation, which should be slowly and deliberately performed, will not seem tedious nor cruel.\*

*In perforating the Skull*—Ascertain first the place most fit for perforation, viz. on the angle of depression, and in the line

\* If you remove the pericranium with the ronge in the first instance, and have the integuments held back, your patient experiencing no pain, will give you no trouble. S.



of the fissure where the fissure is wide and gaping: on the broken bone, if it be firm, on the sound, if it be so unsteady as not to bear the pressure of the centre-pin, or the working of the saw; in the middle of the carious portion, when there is caries without fracture; and any where on the side opposite to that paralysed, but especially a little below and to one side of the centre of the parietal bone, when there is reason to believe the brain oppressed by extravasation, without any visible injury to mark the place.

Lift first the crown of the trepan you mean to apply; press it firm to the bone, and make one or two turns in order to mark the centre of the circle, by penetrating with the centre-pin a little way: next dismount the trepan head; take the triangular perforator, and having fixed it in the shaft, bore with it a central hole, for the centre-pin, deep enough to hold it securely while you perforate: then mounting the crown of the trepan again, place the centre-pin of it in that hole, and begin to saw: in cutting with the trephine, which turns in half circles, observe well the way in which the teeth are set, for they are set obliquely; you may be turning and twisting it, and that very vigorously, as I have seen some surgeons do, without cutting more than a right-handed person would pierce a cork by turning a left-handed cork-screw: as your trephine turns but half circles, you must inevitably cut deeper on that side of the circle towards which the hand turns; you must therefore probe frequently (especially when there is much bleeding, or when you are sensible of having cut deep) with the tooth-pick; and when you feel that you have penetrated\* on one side, *CHANGE YOUR POSTURE*, turn half round the patient, which, by giving your hand a new inclination, sets it right for cutting what remains, which, in such delicate circumstances, and having so nearly completed the perforation, must be cautiously done and slowly.

In the course of perforating, while you probe with the quill, you give the crown of the trepan to your assistant to be brushed, or to be altogether changed; and when you are satisfied of the depth of your perforation, he, in returning it to you, wipes away the saw-dust with the same brush.

I seldom have completed the perforation, never have got out the trepan circle sticking in the crown of the trepan, but have sometimes poised it out with the handle of the scalpel, or the

\* I would advise the surgeon to change his posture several times when he thinks he is nearly through, so as to endeavour not to have the scull thick in one place and perforated in another, but try to cut so uniformly as not to let the instrument get through at all; but when the whole is thin, break up the piece with the elevator. For where the dura mater adheres closely to the bone, he will be very apt to wound it if he suffers his instrument to cut through. S.



pointed extremity of the forceps marked (D). While sawing, whether in trepanning or in amputation, never think to overcome difficulty or resistance by pressure, but when you feel opposition, cut lightly, and turn the saw nimbly, lighten your hand when it threatens to stop; never in sawing a long bone expect to loosen the saw by pushing and wriggling, but by withdrawing it, nor in trepanning by pressing onwards, but by turning the trephine half round backwards. Choose trepan crowns with the sides grooved and sharpened, as well as the points of the teeth, for that kind of saw cuts wider as it goes deeper, and works the whole circle of the bone large and free for the trepan to move in.

5. *In respect to the Object of the Perforation*—You will find that extravasated blood rolls out spontaneously, in black and firm clots, through the trepan hole; and from dressing to dressing is easily hooked out, with an armed probe, or washed out with tepid water, the dura mater coming gradually into closer contact with the skull: pus flows out still more easily, and multiplied operations for either purpose (of letting out blood or pus) are extremely imprudent; to repeat the perforation is sometimes necessary, on account of a great depression attended with manifest danger, where the edges of the depressed portion are fast locked under projecting corners of the firm skull, and the lever being introduced first into one, then into the other perforation, the depression is raised, but never without great force, usually a loud noise, and sometimes, as I have argued, with unjustifiable violence, insomuch that on many occasions, especially where the depression is flat, extensive, and having probably no offending points, I would rather leave it unreduced: unless in depressions of a singular and dangerous form, punctured fractures, and those where, from their peculiar form, there is strong reason to suspect spiculæ, I am not curious about depressions, nor over-anxious in raising every point.

6. *In respect of Dressings*—I would intreat you to consult your own good sense, rather than hearken to the common ignorant advice of laying merely a piece of oiled lint on the wound, and over that a poultice. The old practice of cutting a circular piece of cloth as a syndon, and cramming it under the skull to support the brain, and leave room for matter and blood flowing out, I entirely disapprove of, but neither can I approve of leaving it quite unsupported; in short, I dress the trepanned skull, as I do every other wound, nicely and carefully: first, I lay the edges of the scalp smoothly together, sometimes stitching it with one or two points of the needle; then I lay upon it a small pledgit of oiled lint; next a small and rather firm compress of lint; next a general compress over the whole of that side of the

head ; and finally, I roll the head gently, but steadily and somewhat firmly, with a broad roller, and put over that a thin linen cap, lightly tied under the chin.

I allow no poulticing, except what is necessary to bring off the first dressings ; and no washing nor curious cleansing of the wound, which I wipe slightly, and dress with very little ointment, almost dry : when blood still exudes, that makes an exception, being a special case ; and when a fungus threatens to protrude, and even where only the sound, but granulating dura mater projects through the trepan hole, I find it necessary sometimes to depress the dura mater, or push aside the fungus, to let the matter, confined from dressing to dressing, flow out ; then, contrary to my usual practice, I think it right to dress morning and evening.

When, in the course of the cure, fungus protrudes and fills the opening, and the confinement of matter causes stupor and hemiplegia, and the inflammation of the brain, cries and convulsions, I reckon my patient lost ; but I am proportionably more diligent in my methods of procuring a free efflux of the matter, and I think it better to shave off the protruding fungus than to apply escharotics, which I have usually found hurtful.

It is invariably found that noise, heat, wine, passion, and other exciting causes, are fatal to those who have suffered the operation of trepan : the confusion of a storm, after a battle at sea ; the renewal of the engagement ; the hour of firing the batteries in a besieged city ; the intrusion of unwelcome visitors in the chamber of a private person ; quarrels, intemperance, or venery, have in many instances brought on inflammation of the brain, such as has proved fatal to those far advanced in their recovery after this dangerous operation ; therefore let them be kept low, still, quiet, with a loose belly, a perspirable skin, little light, and few visitors, and no conversation but such as is composing and cheerful.

#### SECTION V.

#### *Aphorisms, or Rules of Practice, deduced from the foregoing Discourses.*

We have examined in detail every point of practice, and are now arrived at the conclusion of these discourses, in which it is natural to recapitulate whatever is important, and ascertain whatever rules should particularly dwell upon your memory. This task, could I entirely acquit myself of prolixness in these discourses, might be spared ; yet it will be useful, I doubt not, to explain in short aphoristic rules what an experienced surgeon would naturally do in any given case.

1. Above all things I counsel you to beware of precipitation; the only fault which can incline the surgeon to conceal the circumstances of his private practice, or leave upon his mind any lasting unhappiness: I entreat you, on every new occurrence, to think deliberately, judge soberly, and act gently; however urgent a case may seem, be in no haste to operate, take time to consult, and rest assured that nature will often perform a cure while you are deliberating upon an operation; be also assured that you can never fail, in the worst cases, to foresee the patient's death, by his coldness, paleness, convulsive motions, and involuntary stools: if these signs have not yet appeared, you have time for a few hours deliberate reflection, if they are already begun, you have then, least of all, any motive for precipitate measures, you are surely too late, the patient must die.

2. Fractures and injuries of the head are more frequent in public hospitals, where the friends of the patient, or the spectators of any unfortunate accident, leave him almost inanimate, perhaps with only some slight apparent injury of the head, while there is some serious damage to the brain, the nature of which you are ill able to develope, without knowing how the patient was struck, or where he fell: let your first step be to collect the friends or spectators, and inquire into the circumstances of the fall or blow. Let it be an especial rule with you, never, in these cases, to do any thing precipitate or rash.

3. Every man of prudence and discretion, while he examines the wound, and reasons on the symptoms, inquires into the circumstances in which the patient was hurt: whether by a fall or by a blow; whether, when he fell, he was drunk or sober, helpless, and pitching headlong, or in his senses, aware of his danger, and by extending his arms breaking the force of the fall: whether he pitched headlong over a rail, or tumbled down stairs, touching each step: whether he fell on plain ground, or on a declivity, and if he received a blow, whether he was struck by accident or by design; at arms length or close; with a heavy weapon or with a sharp one; by a feeble man or a strong; by a drunken man without aim or force, or by an angry man, in the height of rage, and with full effect.

4. There are certain kinds of accidents which import danger, each according to its peculiar nature; as A CONCUSSION, A CONTUSION, A WOUND WITH A SHARP WEAPON, A PUNCTURED WOUND. Writers on jurisprudence have long distinguished these kinds of wound, of which the danger is in some immediate, while in others it is deferred till the fortieth or till the hundredth day, and have been accustomed to affirm that the more the skull is fractured the less the danger, the breaking of the skull deadening the force of the blow. Of all the quaint



reasons which authors have given, not one is true ; but yet it is a fact, that the man who has an extensive fracture of the scull escapes, while he who has no fracture dies. It is not because the yielding of the bone lessens the force of the blow upon the organ which that bone protects, but because concussion is a more dangerous injury than fracture, even though accompanied with deep depression of the scull : there is great danger in the case of concussion, though there be no fracture ! there is little comparative danger in fracture when there is no concussion ! when, from the nature of the fall, the concussion is great, no degree of fracture can lessen the danger, for the danger lies in the concussion or injury of the brain which is produced by a fall, not in fracture, which affects only the scull, and is occasioned by the blow. If a mason fall from the tiles of a house, or a sailor from the yards or rigging of a ship, and fracture his scull, the greatness of the fall lessens in no degree the violence of the concussion ; the extent of the fracture marks rather a probable concussion, of which, if it be great, the patient dies : but if the tiles fall upon the mason, or the sailor is knocked down by the falling of a block and tackle, a great fracture does not cause an equal degree of injury, much less if he is knocked down with an handspike, and still less, if his scull be but cut with a cutlass ; the fracture may be in such cases great, and the concussion and consequent danger slight : in short, the scull is most fractured by those blows which are least injurious, and least injured by those general shocks which cause the most dangerous concussions and extravasations in the brain.

5. As a bruise is worse than a wound, and a sprain or luxation of a limb more distressing in its consequences than a fracture, so is concussion of the brain more dangerous than wounds or fractures of the scull : to the distinctions I have hinted at, I should wish to remind you of one which I have remarked : if by a fall your patient lie in a state of stupor, it may be from *Concussion* : if, after a smart blow with a bludgeon, not heavy nor depriving the patient instantly of his senses, it must be from *extravasation*.

6. It is not with every kind or degree of stupor that an experienced surgeon is alarmed, he is accustomed to distinguish many kinds, as well as degrees, of that affection : the stupor may be that of *intoxication*, which, by the smell and the vomiting, he often is able to distinguish, and never is afraid to leave the head of the patient untouched till the longest period of intoxication (if it be intoxication) and all its consequences have expired ; or it may be that of *slight concussion*, which, being attended with no oppression of pulse, nor suspension of breathing, is soon resolved by the natural force of the circula-



tion: or it may be that stupor which, in *old age*, generally follows a blow or fall, without indicating, as far as I have observed, any permanent injury: but if the *stupor*, though slight, is accompanied with *vomiting*, and a *slow intermitting pulse*, there is reason to apprehend the most imminent danger.

7. Nor does every degree or kind of delirium alarm him: delirium, arising after stupor, is a favourable sign: a wound of the scalp is often followed by *erysipelatous swelling*, and a short and harmless delirium: a patient, thrown into an hospital with wound of the scalp, is often seized with sudden *rigours*, vomiting, high fever, and delirium, but these are the symptoms of *hospital fever* merely, and might as well be superinduced after a wound of the finger, as after a wound of the scalp: one who has formerly suffered much from fevers, or *who has been insane*, is more apt, as I have known in several instances, to awaken in a state of *phrenzy*, after lying some time under the stupor of a blow: these are not dangerous cases of delirium; and though stupor, insensibility, rigours, and other marks of suppuration or of effusion of blood, may be motives for applying the trepan, DELIRIUM, as far as I can recollect or imagine, never is.

8. I believe the danger to be prognosticated is very nearly in this gradation: *Stupor*, though deep, and to the tyro seemingly very dangerous, is not a cause of immediate alarm to the experienced surgeon: *Delirium*, succeeding such stupor, shows that the vascular action is begun, and the oppression at an end. *Slighter somnolency*, free from stupor, in which the patient has his senses, (though inclined to sleep) but with a heavy, oppressed, and intermitting pulse, is extremely alarming, and requires the trepan: *Stupor*, accompanied with dilated pupil, and *palsy of one side*, indicates the most imminent danger, yet such as is often relieved by the trepan. Stupor, in which the *face is pale*, the *extremities cold*, the *pulse* not heavy and labouring, but *quick and fluttering*, especially if attended with palsy of one side, or slight convulsions agitating the features or the limbs, is a state altogether to be despaired of: yet perhaps it is even here our duty to operate, but without hope.

9. The *prognostics from tumours*, I must remind you, are still more interesting; for any peculiarity in the tumour indicating the death of the bone below, more certainly foretels danger to the brain than the most formidable fracture: *First*, Where the *scalp merely* is wounded, perhaps *punctured*, but no tumour ensues, the patient is often affected with spasms in the face, and the most ludicrous contortions of the mouth; this is a symptom much resembling that contraction which follows the wounding of a nerve in bleeding, and, like it, requires an inci-

sion. I have at this moment, under my care, a little boy, of ten years old, who, having fallen over a stair-case in swarming the baluster, was taken up apparently dead, has lain for two days in a state of deep stupor, is now entirely recovered from it; he has his mouth turned more entirely to one side than I ever saw it in a paralytic, and though able to run about among his play-fellows, does not expose himself among them; this, I have promised confidently, (because I have often seen it) will go off.—*Secondly*, *Erysipelas* often seizes the scalp after slight wounds, extends over the face and ears, closes the eye-lids, is attended with smart inflammatory fever and delirium, but subsides in a few days.—*Thirdly*, *A bloody effusion*, if the blood be in great quantity and the effusion permanent, is sometimes dangerous to the skull; but I must remind you of a danger of another nature, viz. of a feeling as if of depression of the skull, so particular that even the experienced are apt to be deceived: but an experienced surgeon is in no haste to make incision into such tumour, even though the patient is vomiting, and in a state of stupor; these usually are but the first consequences of the injury, and, like the tumour, vanish. I have seen extravasation so extensive as to fluctuate from ear to ear, and yielding so as to admit the finger to feel depression of the bone, yet the whole has been absorbed.—*Fourthly*, The most portentous tumour is the least formidable in appearance; for it is one which proceeds neither from extravasation nor inflammation; it is neither red, inflamed, fluctuating, nor extensive, but arising from the death of the cellular substance next the bone, and from the impossibility of the dead surfaces renewing their adhesion, thence it is *Emphysematous*, *puffy*, *small*, *circumscribed*, not painful: is accompanied with rigours or febrile shiverings, and starting or nervous tremblings; confusion of head, and feebleness of body and mind: it is the most desperate disorder with the slightest symptoms: suppuration of the dura mater is begun, and if, upon the slightest intimation of this kind of danger, the patient be not trepanned, he dies.

10. As your preceptor, I am much more jealous of your being found wanting in judgment than in skill: your operations, I doubt not, will be performed with address, but I am truly anxious that your address should be reserved for occasions of real danger, and that the powers of nature should never be anticipated nor interrupted, by any rashness of yours.—*First*, be not too confident in promising a speedy recovery; even in slight and cutaneous wounds, for the bone, though not wounded, may be deadened by the blow; but lay the edges together, and stitch them lightly and gently to procure re-union: dress the wound dry with lint, court-plaster, and a sprinkling of

hair-powder, which, by caking with the blood, keeps the edges of the wound in close and nice contact : and watch your patient's condition constantly, especially where the wound has been made with a bludgeon, a stone, or any blunt and heavy body.—*Second*, be not afraid of an open though apparently a desperate wound, even when the skull is cut or fractured, even “where the splinters of it lie pashed upon the dura mater :” there is in such a case undeniable danger, since the bone is wounded and all the parts inflamed which defend and lie in contact with the brain ; but such open wound, though wide, is often less dangerous than a slight contusion ; it is but a *compound fracture of the skull*, and you have no warrant for doing any thing which you would not do in a *compound fracture of any other part*. I spoke of *Pariée’s* operation on Captain Hydron, and of bone re-uniting with bone, I meant but to illustrate a general doctrine, not to announce a rule of practice : I advise you, to pick away carefully every fragment of the skull, to dissect away whatever little fragments you may find adhering to the scalp, and to lay down soft and sound integuments only upon the wounded skull and exposed dura mater.—*Third*, be not careless of cleansing the scalp and laying it nicely and smoothly down, because of my having proved to you that ragged integuments or scalp having even its inner surface ingrained with mud and dirt, has adhered, for such proofs were but meant to illustrate a general principle, to show how tenacious both the skull and integuments are, of life and circulation : to lay them down ragged or foul were the height of presumption, and a most culpable carelessness ; pick the surfaces, cleanse them with the sponge, do every thing to entitle you to success ; when you stitch the lacerated parts together, do it lightly, and dress the edges dry ; do not, in your anxiety to cleanse them from sand or mud, wrap the head in a poultice, expecting to unite the parts after suppuration is begun, for after suppuration they curl backwards and retract ; they never, as far as I have seen, can be laid together again, but heal with a gap equivalent to an actual loss of substance : having stitched the integuments, watch the state of the wound diligently, and the instant you observe the stitches overstrained by the swelling of the scalp, or can perceive that matter is confined, the bone bare, and the probe admitted under the diseased scalp, lay the wound open, and then use a poultice, and wait patiently the granulation of the naked bone, or the signs of internal suppuration, to direct your future steps.—*Fourth*, be upon your guard against the irretrievable fault of making incision into the integuments when they are entire, however distinctly you feel a fracture or depression through them, for it is wonderful how happily the hurt



parts heal and the extravasation of blood is resolved when the parts are kept entire ; the making an incision in such a case is converting a simple into a compound fracture, with all the dangers of it ; nothing can vindicate you in taking such a step but the most unequivocal proofs of a concomitant extravasation of blood ; viz. oppression, somnolency, a heavy pausing pulse, a dilated pupil, and palsy of one side : make such incision (the integuments I mean being uninjured) only after great deliberation in adults, and in boys never, or almost never.\*—*Fifth*, be not too rash in entering upon an operation, merely because the patient lies in a state of stupor or breaks out into delirium ; those are the cases which least frequently require the trepan : and when you are entered upon an operation, be not too particular in raising every point or piece of bone that either seems or is really depressed : but above all, be not too late in operating when there is reason to suspect a suppuration of the dura mater ; make it a principle, whatever the occasion may be for using the knife or saw, to be *sparing of the integuments*, for the loss of them affects the skull, to be *still more sparing of the skull*, for it supports the dura mater, and to think with the utmost reluctance of *puncturing the dura mater* strong as the suspicions may be of blood being extravasated under it, for, like a second skull, this firm and strong membrane supports the brain after perforation, and when it is punctured the brain is deprived of all support, and I have never failed to see it protrude : I will not disguise from you that this operation of puncturing the dura mater is sometimes successful, that it is reported so by creditable authors, but it is my duty to inform you that I have always found it fatal.

11. In respect to the medical treatment of your patient, I must remind you, that the first moment of stupor, coldness, and paleness, requires cordials ; but the reaction that follows, requires that the powers of the circulation should be repressed : and I must also remind you, that such accidents happen chiefly to workmen, vigorous, strong, and healthy, full of blood, and often in the prime of life, that though there are many who boldly deny the use of bleeding, they speak from theory, while none dare neglect it who are acquainted with practice : many times the patient lifts his eyes and moves his limbs while the blood is yet flowing from the vein, and many are thus recovered who otherwise would never move them again : bleeding is useful in all contusions, falls, and blows, to arrest the progress of extravasation ; but where extravasation has already taken place, and one side is palsied, blood should not be too profuse-

\* See note, page 329.



ly drawn away, lest the strength suddenly sink : the brain being already compressed and the vital powers low, it is peculiarly dangerous to draw away much blood. In concussion, which is an apoplectic state of the brain, consisting at once in fullness of vessels and general exudation, bleeding relieves the oppression and promotes absorption : in stupor, with a heavy pulse, throbbing gradually stronger and stronger, and increasing at the same time in velocity, bleeding must be used to prevent the reaction rising to delirium ; and when delirium actually rages, and the patient starts from his bed, and strikes and struggles, it is most eminently required to save the organization of the brain from the intense action of its own vascular system : frequent bleedings, drastic purges of calomel, and cold applications, and cool air, are useful ; blisters\* and opium, doubtful in their operation ; and all other stimulants, as wine, volatile alkali, &c. quite improper.

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## DISCOURSE XXI.

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### ON TUMOURS.

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#### SECTION I.

##### *Preliminary Observations.*

IT is, I am persuaded, my first duty to display the importance of this department of our science, and to interest your sympathy and reason in behalf of those who are afflicted with tumours ; of which, though some are harmless, far the greater number, by their cancerous or malignant nature, by oppressing the organs of breathing and swallowing, by destroying the bones, or even affecting (when seated on the head or in the nostrils) the

\* Blisters are strongly, and I think justly recommended by Mr. Abernethy. S.

functions of the brain itself, bring the patient, and that too in the vigour and prime of life, to an untimely grave. In each subdivision of our subject I shall have occasion to lay before you examples of neglected and fatal tumours, of dismal scenes which the surgeon did not dare to prevent; of operations rashly begun, and abandoned in the very moment of execution; we need not seek for sad and persuasive examples of such danger to impress the importance of the subject upon our minds, nor strive to recollect minutely the long-continued sufferings of those who have died of tumours. The scenes we have witnessed in Hospitals, or in private practice, return to the imagination from time to time, accompanied with all their tragical circumstances; we recollect the sufferings of our patients, and we also remember that the most loathsome, painful, and, in the end, fatal tumours, were once trivial; we also know that thousands, at this present time, are verging towards that hopeless desperate state from which even the most intrepid surgeon will not attempt their rescue, at the peril of his reputation and eternal peace of mind.

Tumours are the most frequent of all surgical diseases; every surgeon must find the treatment of tumours, a part of his daily practice: a tumour, in whatever part of the body it is seated, requires an intimate acquaintance with the structure of that part, and a clear recollection of all the precedents or rules which may serve either to direct the judgment, or to guide the hand. The surgeon should know how to resolve a tumour, or to excite it to suppuration; how to evacuate the matter, and obliterate the sac; when to suffer the mild and harmless to grow, and how to extirpate at every risk that which is prone to ulceration or cancer. Every tumour is a subject of new and anxious consultation, and every operation of this irregular nature, demands a knowledge of blood-vessels and nerves not easily remembered, and perhaps no where truly described.

Need I remind you what torture a skilful surgeon may prevent, what misfortunes ignorance may cause? Do we not see surgeons mistaking tumours, malignant in their nature, for indolent and harmless swellings of the glands? By tormenting a simple tumour it may become malignant,—by neglecting a moveable tumour it may become fixed,—by allowing a small and seemingly harmless tumour to grow, it may wax to so great a size, and acquire such intimate connections with the more important vessels and nerves as to defy all kind of surgery.

Look well, then, to the nature and probable consequences of every tumour; for a tumour, though void of any character of peculiar malignity, will, if seated in the passages of the nose or the throat, on a bone, or in connection with great vessels or

nerves, have all the ill effects of a malignant tumour without being so, by bringing caries upon the bones, causing disease and ulceration in the nostrils, compressing the throat, and weaving in its roots with the great vessels and nerves, and from this universal fact results this incontrovertible rule of practice, "That no suspicious tumour, seated in a dangerous part, should be permitted to grow." Secondly, That almost every tumour, though seemingly indolent in its nature, has its period of ulceration. A tumour of mere fat, a tumour in which the adipose membrane is alone diseased, a steatomatous, or an ulcerous tumour in which is collected an increased secretion, partly fluid and partly solid, or purely of fat, is indeed harmless, unless by its bulk and weight, and when it suppurates it suppurates mildly: but wherever any part of the body, except the cellular fat or muscular flesh is engaged in the disease, wherever the eye, the breast, the testicle, a bone or a joint; wherever, in short, any part, having a complicated structure, is affected, however long it may have held the character of a mere overgrowth or simple tumour, it is ever to be feared, that sooner or later, its structure will undergo unfavourable changes, from long distention, from occasional excitement, from blows or other injuries, and from changes seemingly internal and spontaneous; or, in other words, from physical causes which our patient has not remarked, and which we cannot trace. Thence results another rule equally established in my mind, that no tumour of a doubtful nature should be permitted to grow, even through that period in which it seems indolent; for when it inflames or compresses the surrounding parts, when it is likely to suffocate our patient, or to end in a malignant and fetid sore, it is so fixed as to defy all surgery.

I have perhaps reason to suspect the opinion I have conceived of the importance of a subject, which, from long contemplating it in its various relations, has made an impression on my mind which gains strength while I endeavour to infuse it into yours; to an author, his favourite theme, his present theme, seems ever important. The surgeon, no doubt, when he proclaims the importance of a favourite subject, is bound in a peculiar manner to prove it in detail,—to prove it by facts; yet I know not why he should be debarred the common privilege of explaining without a pointed reference to facts, whence the general impressions he has received have taken their rise: he most of all may be pardoned an overweening love of his profession, who sees it daily a source of relief from pain, from danger, and from death inevitable, but for his interposition: he may be acquitted of any affectation of extraordinary sympathy and feeling, who has been called at all hours and seasons, from

his bed, his table, his family, to witness the agonies of a friend suffocating from the bulk of a tumour,—alarmed with hemorrhagies which threaten life, or wasting under the cruel pains of cancer. Can the surgeon be accused of affected sensibility, who describes with interest scenes in which he has so great a share, so far different from that even of the nearest friend, so much the more responsible? He alone sees all the variety of misery, the least part of which, if witnessed by common spectators, is related in affecting terms; he alone knows the trivial beginnings and sad conclusions of diseases, and can form a true estimate of their importance. The surgeon, in representing the interest which particular diseases should excite, deals not in the fantastic horrors which the moralist conjures up when he declaims against the vices of a declining age, or the politician, when the iniquity of public measures is his theme, and he predicts the ruin of his country: the surgeon's mind is occupied with distinct, impressive recollections of what individuals have suffered; though steeped in the colour of his trade, inured to blood, he may be allowed to feel every degree of sympathy with scenes of distress, presented to his imagination in such various and afflicting forms.

Believe me, Gentlemen, I use no art to engage you in this department of study, and do not seek by exaggeration to enhance its importance: what I think and feel, I must, in justice to you, speak freely, and without restraint; and surely no way can be so faultless as to lay before you a slight and preliminary sketch of the various parts subject to tumours, and the various consequences of their growth, as they affect the skin, the glands, the bones, the eye, the breast, the testicle, the throat, the rectum, or other hollow passages of the body, ruining by pressure and ulceration, the structure of the affected, and the adjacent parts.

## SECTION II.

### *Of the parts most subject to Tumours.*

THE SKIN is the part of the body perhaps the most vascular and delicate, and is often by injuries, as by the pulling off the hair, or the pinching or bruising of its vessels so excited, that its vessels taking on a lively action, its arteries and veins are in process of time dilated, and form aneurisms, or bleeding tumours; or they are merely by such excitement so quickened in their ordinary function of nutrition, that the whole web of in-



teguments becomes a tumour, retains its natural form and substance, with only some slight enlargement of its pores and papillæ, but becomes so voluminous as to be wrapped round the body, forming thus the most extraordinary tumours, which are still nothing but skin.

The BONES, as vascular as the softer parts, and perhaps more regularly and unceasingly absorbed and replaced, form, when they are injured, the most bulky, and, from their solid texture, the most permanent tumours, which, when they turn to ulceration and caries, are the most incurable and fatal. We very frequently observe a tumour of a bone to follow a blow, and, when the blow and the swelling take place near a joint, when the knee, the wrist, the shoulder, or the ankle are involved in the tumour, its growth is extremely rapid. Often I have seen the radius, when the wrist has been fractured and ill re-united, form an enormous bony tumour; or the heads of the tibia and fibula swell out in consequence of a bruise into a tumour cavernous and gristly, partly occupied with matter and partly formed of a solid increase of bone, till the thigh almost equalled the body in thickness. Very often such tumours bursting pour out the most fetid matter; and large bony cavities, or numerous honey-comb-like cells are formed. Often too without external violence, without any conspicuous marks of a scrophulous habit, without any possible relation to venereal diseases; the bones universally are disposed to form tumours, by which sometimes the hands are deformed, the wrists swelled, the fingers crooked like birds' talons, and sometimes the long bones, as the thigh-bones, shoulder-bones, ribs or scapulas, are studded with large knobs or grow out in tumours. These are diseases still more dismal, quite irremediable.

The GLANDS, when their vessels are excited by blows, by cold, by the absorption of foul and virulent matter, are enlarged beyond all credible limits, and draw the adjacent parts into disease, insomuch that the tumour which originally was a simple gland has, in the end, a very anomalous aspect, and conveys such confused impressions to the feel, that we know not how to pronounce upon its nature, which the history only of the tumour can in any degree elucidate. These are the tumours which, when seated either within the mouth, or at the angle of the jaw, repress the tongue, displace the trachea, or obstruct the free passage of the food and air, and connect themselves so with the branches of the carotid arteries, that the hand of the most intrepid surgeon can no longer avail, and wise and prudent men, met in consultation, shrink from those duties which the patient's manifest danger plainly imposes, lest they should bring, not themselves only, but their profession into disgrace.

The EYE, a part at once exquisitely sensible, and exquisitely vascular, and consisting of humours which are in a state of continual circulation, being continually secreted and re-absorbed, grows by the slightest excess of vascular action into a tumour. Sometimes the secretion of aqueous humour, not changed, but merely augmented, distends the globe of the eye into a tumour continually increasing, till first vision is deranged, (not destroyed) next head-aches ensue, and, finally, the coats of the eye give way. On other occasions the adnata, or loose and vascular coat of the eye, arising from the inner surface of the eyelids and connecting them with the skin, is so swelled by inflammation, that its cellular substance being of a spongy nature, the tumour of it covers and involves the whole eye, conceals the eye-ball, protrudes far beyond the eyelids red, flesh-like, and often ulcerated, so as to seem in the hasty opinion of ignorant surgeons a cancer of the eye: even for such a disease, so little connected with the globe of the eye, or allied with cancer, have I known the whole eye-ball extirpated. Sometimes the deeper parts of the eye are so inflamed as to terminate in suppuration of the globe, after delirium and dreadful pains; then the central parts having suppurated, the firm coats of the eye at last ulcerate, the globe bursts, the eye subsides into its socket, and the eyelids close upon what remains of its coats: but these, thickened by continual inflammation, harden and grow into a new and more formidable tumour; and the eye protrudes again from its socket, of a schirrous hardness, with a painful and burning ulceration. Sometimes from a suppuration less deep or extensive, where not the vitreous humour or whole body of the eye, but only the cornea and the iris, are diseased, the eye becomes cancerous; for when, after a partial suppuration and ulceration of the eye, the iris very often throws out a fungus, bearing the true character of cancer, even from the first, or becoming so by the excoriation of the tears, and the friction of the eyelids. The lachrymal gland seated within the socket is often, as I shall have occasion to explain by examples, a cause of incurable disease, and the small glands or lacunæ of the tarsus, or cartilaginous borders of the eyelids, form tumours extremely firm and unalterable in their nature, sometimes indeed stationary, but never resolving under any course of treatment, and often causing such pain and inflammation of the eye as to require extirpation. All the parts, in short, of this delicate organ, whether proper or merely adjacent, are subject to tumours more frequently cancerous than mild.

The BREAST is a gland destined to perform a secretion more profuse and rapid, in proportion to its size, than even that of the salivary glands, and more elaborate. It is subject to great pe-

riodical excitements; at each menstrual period it swells slightly, is greatly enlarged by pregnancy and suckling, and in warm climates, or diseased constitutions, in all countries, it is the part first and most conspicuously enlarged. The period of life at which menstruation ceases is so critical for this gland, that it then falls into scrophulous and cancerous diseases, having every variety of aspect. Sometimes the whole breast is indurated and enlarged, with a swelling so truly scrophulous, that I have seen the breast suppurate, burst out like other scrophulous glands, heal at one point and ulcerate in another, become indurated to an extreme degree, and pour out from various openings a limpid serum in profusion, proportioned to the natural secretion of the gland. Often there takes place, both in women who give milk and in those more advanced in years, a voluminous abscess, which is both formed so slowly, and lies involved in so thick a mass of indurated gland, and so void of pain, that it is distinctly marked as a scrophulous disease. In both the affections of the mamma here described, though as far removed from schirrus, as scrophulous swelling of the testicle from cancer of that part, I have seen the breast amputated with circumstances of particular cruelty. From scrophulous inflammation, blows, milk-fever, or, in consequence of that indescribable change which takes place at the ceasing of menstruation, the gland of the breast is hardened, either in one mass or in separate kernels, which, however long they may remain indolent, become sooner or later inflamed, and then the proper gland of the breast, the lymphatic glands connected with it, the skin, and cellular substance, even the pectoral muscle itself, are apt to be massed together into one hard globular and ponderous tumour, with separate glandular tumours interspersed in the surrounding cellular substance. When this mass ulcerates, the axillary glands, previously indurated, also inflame; the skin of the axilla reddens, as that of the breast ulcerates; the whole armpit swells, the arm becomes œdematous, and lies powerless; and the patient dies in a most loathsome state, with foul and very fetid matter running from the sore in great profusion, so as to make the last offices of friends difficult to perform. Sometimes this disease begins like a kernel in the centre of the gland, sometimes like an excoriation of the nipple, sometimes like a mere contraction and induration of the skin, not beginning invariably round the nipple, but extending, as I have several times remarked, from the axilla downwards, so as to affect the breast. Thus a careful observer sees in the course of practice a sad variety of disease in this part, according with the various structure of those parts in which the disease begins, or the species of the malady,



whether varicose, scrophulous, or cancerous; varieties which, simple as the part seems to be, are as widely different from each other, as venereal, scrophulous, or simple inflammatory affections of the eye are from one another, or affections of the cornea from those of the humours.

The TESTICLE is a part subject, like the eye and breast, to cancerous affections, often commencing in venereal inflammation, affecting the structure of the gland, or arising from blows or falls, complicated almost always with a watery tumour of the tunica vaginalis, and indurations of the spermatic chord. These diseases, too often concealed even from the surgeon, arrive at their last stage undivulged: but the scene is dreadful indeed when either before operation the testicle bursts out into open ulcer, or, after an operation performed too late, the chord, being diseased, protrudes from the upper angle of the wound in the form of a fungus or cauliflower-like tumour, which it is in vain to extirpate with either ligature or knife, for it shoots out again in a day, bleeds, and discharges the most fetid sanies, accompanied with cruel pains of which the patient expires.

The MEMBRANES LINING the NOSTRILS are of so vascular and glandular a nature, so continually exposed to the air, and yet so delicate and sensitive, that tumours arise even from the very slightest irritation. These tumours, mild perhaps in their own nature, are dreadful in their consequences, from being seated in narrow passages, limited not by dilatable membranes, but by unyielding bones, which suffer every kind of disorder when the passages begin to be filled with even the softest of these tumours, while the cavities of the antrum highmorianum, and other cells far out of the reach of instruments, are often occupied by tumours of a more malignant nature. So destructive are the consequences of even the mildest tumour, growing and distending these passages, that we know not how to admit or refuse that definition of tumour so often mentioned in books, "The CANCEROUS POLYPUS;" for no cancer can be more destructive than even the most simple polypus. Little does the patient apprehend the fate that awaits him, when a small tumour which he can just touch with the point of the finger, soft, pendulous, void of pain, and attended with no worse disorder than sneezing and watering of the eyes, first appears: it is not that slight sense of suffocation which first alarms him, increasing to a total obstruction, that occasions his death; but the narrowness and crookedness of the passages of the nostrils and throat, and the vicinity of those parts to the brain, separated indeed only by the thin plate of the ethmoid bone that occasions death. The bones first become soft and carious, and discharge a fetid and acrid matter, which distils in such profusion as to excoriate the



lip, and to cause diarrhœa by running down the nostrils and throat. The blood bursts impetuously from the corroded vessels from time to time : the hearing is entirely interrupted by the pressure of the tumour on the mouths of the Eustachian tubes : the teeth fall out from the sockets, in consequence of the caries of the alveolar processes : the head seems rending asunder with distracting and continual pains : usually the patient is exhausted by long suffering, and frequent loss of blood : sometimes he lives till caries of the ethmoid bone admits the ulceration to the brain, and he dies lethargic.

The GUMS, when they fall into a diseased condition, hard as they are, (and their hardness approaches more nearly to the consistence of the teeth and jaw-bones, which they connect together, than to that of flesh,) throw out tumours so luxuriant, so truly fungous, so profusely supplied with blood, that the hæmorrhagies from them are, even from the first, alarming, and are in the end fatal ; and the tumours, when extirpated with the scalpel, or torn away with ruder instruments, often sprout up, (after the very bones have been laid naked,) in the space of twenty-four hours, and effloresce in the course of a few days into cauliflower-like excrescences, and still grow so rapidly, accompanied with dislocation of the teeth and caries of the jaw, that the patient expires of hæmorrhagy, diarrhœa, and cancerous pain. There is no form of tumour I so greatly dread, none so rapid in its growth, as those proceeding from these callous gums, nor any disease in consequence of which I have suffered such severe, unlooked-for disappointments, or seen such unsuccessful operations and horrible deaths. Sometimes the extirpation is successful, and, I think, I can often predict when it will be so ; but, when it fails, no cauterizing, nor the most cruel processes of surgery, will repress the after growth ; it is truly cancerous, and invariably fatal.

TUMOURS OF THE THROAT, whether external to the jaws, or visible only within, give no alarm but by the effect they produce on the breathing and swallowing ; and yet they are, beyond all comparison, the most dangerous tumours, fatal if neglected, and yet so connected with great vessels and nerves, that to extirpate them is almost impracticable.

Suppurations within the throat of a scrophulous nature are frequent ; and I shall have occasion to lay before you examples of these bursting by multiplied openings into the larynx and œsophagus occasioning suffocation by the matter falling into the trachea, or inanition and death by the contraction of the œsophagus, in consequence of long ulceration. Other tumours again, which, at first sight, the surgeon is disposed to imagine are sacs of purulent or serous matter, and which I confess myself to

have mistaken for such, are sacs of blood formed by dilatation of the extreme arteries and veins ;—aneurisms of that kind, which I have formerly described under the name of aneurisms by anastomosis, but lying too deep under the skin and the platysma myoides muscle, and too near to the great carotid arteries and its accompanying nerves, to admit of extirpation. Sometimes I have found tumours, especially occupying the fore part of the neck, in the place of the thyroid gland, to be sacs of blood, but of a structure widely different from that of those aneurisms, and perfectly curable, distinguishable from those cases of aneurism by anastomosis, in having no pulsation, and a thicker sac. The tumour is stationary in respect of size, and not becoming more turgid upon retaining the breath, nor flatter when the blood is repressed by the hand: there is no congeries of active vessels opening into them, and supplying them with blood. The blood, I find, has all the characters of having remained long in the sac, and the sac itself is of a firm consistence, difficultly brought to suppuration, infinitely more difficult to obliterate than those sacs which contain matter or serum, and leaving behind them a permanent thickening of the throat. Aneurisms of the carotid arteries are not frequent, but I have seen a pure and simple dilatation of this vessel under the angle of the jaw, of the size of a fist, intruding upon the throat rather than projecting outwards, little conspicuous as a tumour, but having an awful throbbing pulse, when the palm of the hand was laid over it. One would fear nothing in such aneurism but the bursting, and the loss of life by hæmorrhagy ; but long before the sac inflames or ulcerates, the fever with which it is accompanied, and the difficulty of swallowing, arising simply from its pressure upon the pharynx, occasion death.

The SALIVARY and LYMPHATIC GLANDS, lying under the tongue, and about the angles of the jaw, are frequently diseased, and form tumours varying greatly in their form and nature, and growing sometimes to an enormous size ; usually they contain a gelatinous matter, thick, ropy, sacculated, and mixed with solid bodies like grains of millet or mustard-seed, sometimes a pultaceous matter : often these tumours are so far fluid, as to give hopes when first the sac is opened, that the tumour will entirely subside, and the sac be easily obliterated ; but so far solid as to mock these expectations, for, while the matter runs out, the base is indurated, so that before the opening of the sac is closed, the base has become a tumour, firm, glandular, and visibly increasing. Sometimes these glandular tumours especially such as are seated under the jaws, though of a stony hardness, are moveable, subject to no pain nor occasional inflammation, not adhering to the skin nor subjacent parts, but

indolent and harmless. Always in children and boys, sometimes too in adults, such indurated glands are harmless, but of firm and knobulated tumours, especially of those seated in the cheek, covered with a coarse, porous, and puckered skin, and connecting themselves strongly with the surrounding parts, livid on their more prominent points, and aching with every change of weather or season, I have never seen a happy issue. There is no safety for the patient who is endangered by such a tumour, except in extirpation ; nor can we assure him that such operation (not always void of danger,) will eradicate the disease.

These preliminary sketches and characters of tumours, shall serve as a slight index of the subjects I have to explain in detail : the varieties of suffering will be but too truly confirmed by facts : the distress the patient suffers who dies of any form of tumour, whether suffocating, carious, or cancerous, exceeds whatever the most eloquent writer on professional subjects could represent, or the warmest imagination conceive. Believe me, it is the sufferings of individuals that have given me such deep impressions, and you shall feel, before I have finished the narratives of the cases corresponding with these characters, how little I am inclined, how little I need to exaggerate, the importance of this subject.

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## DISCOURSE XXII.

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### OF TUMOURS OF THE BONES.

**I**N this discourse, which is devoted to the diseases of the bones, I shall first sketch out to you my conception of those changes which happen in the structure of bone, before it swells into a tumour ; and shall next lay before you the facts in detail, from which those conceptions, true or false, have arisen.

Every tumour must derive its peculiar form from the structure of that part of the body from which it arises ; for it is not seated on the part as a new and accidental existence, but is engendered by its vessels, and is of its actual substance. Many things conspire to give the tumour proceeding from a bone a peculiar



aspect; it is always irregular and anomalous, never simple. I have rarely seen a single bony protuberance arising from the head or the shaft of a single bone. When a bone falls into disease, a large proportion of tendinous and muscular parts, of bursæ, and of cellular substance, partake of the morbid action. The bone lies in the centre of the limb, connected by its larger head with the joint, and by its periosteum with the tendons, bursæ, and muscles; and all this mass of parts is sooner or later affected; and since every deposition from vessels appointed for the secretion of bone is solid, and every increase of such a tumour permanent, it soon attains a great size; it is ponderous and massive from the proportion of bony secretion, and from the various structure of these several parts, it has every irregularity of form and substance.

When the tumour of a bone has attained a considerable size, much of the original structure is destroyed, and a new irregular mass of gelatinous and bony matter is substituted for it. The bony tumour is firm, bulky, and ponderous, but not solid; feeling it from without, we can conjecture of what substance it is composed within; we are sensible that the tumour is covered by a shell, bony in most part of its circumference, cartilaginous in some parts, and throughout the whole, yielding and elastic; we are sensible also, that within, there are irregular points or spiculæ traversing the cavities or cells of the hollow tumour; that these are mixed with the cartilaginous substance, and with irregular collections of matter, partly purulent, but chiefly gelatinous; and we find at last, by pain and partial ulcerations, and by the increase of fluctuation and redness at particular points, that ulceration, the last stage of the disease, approaches; then the limb is effectually ruined, and the patient must submit to amputation, or die hectic.

When such tumour is dissected, we find our suspicions of its internal structure confirmed; we see that foul matter flow out, when we open into the centre of the tumour, which we felt but indistinctly through its walls; the parts of which appeared the most solid, are hollowed out by ulceration, and full of foul and putrid sanies; while the bone has been declining into disease, the cancelli and marrow have been degenerating into a sort of fatty mass, with which much of the cavity of the tumour is filled, and thence such disease has been very generally described under the name *osteosteatoma*. This fatty secretion, occupying the diseased cavity, is the part, which, when the tumour bursts into open ulcer, throws out such prolific fungus, growing apparently from the substance of the bone, and sprouting up when amputated, in the course of a few hours. The solid bone, whether radius or thigh-bone, is annihilated, and a mere shell of



osseous matter substituted in its place, and that in a manner so peculiar, that it must seem to the unintelligent observer, as if the small and solid bone had been expanded into an extensive and flat plate of osseous substance, whereas the process is in truth very simple and very intelligible. The bone dies piecemeal of ulceration, or what, in technical language is termed caries, and is conveyed away by absorption; but the bone being dead, the surrounding membranes, viz. the periosteum and tendinous expansions, which once formed a part of its system of circulation, continue still alive, and ready to secrete new bone; and thus it happens that while carious abscess preserves a large cavity full of foul matter, the surrounding membranes continue secreting bone, which, like a shell, thin and expanded, covers this cavity, and forms the walls of the tumour, of which some part is composed of thin expanded bone, resembling a cranium, some of cartilage, some of thickened membrane; and this shell is formed in proportion as the original fabric of the bone is destroyed.

Bone is destroyed by this internal ulceration, just as it is by open caries, piecemeal; the process would not be ulceration, if, while one part were perishing the other were not active and secreting new matter; so vigorous still is the general life of the bone, that while the internal parts are thus suffering, while one side is wasting with ulcer, the other side is often secreting bone irregularly and profusely, and shooting out into fantastic forms among the membranes and surrounding parts, whence the centre of the tumour is cavernous and cellular, and the walls often rough with spinous and projecting points. So merely local is the action of arteries in a tumour, whether osseous or soft, that one side, or part, or bump of a tumour, grows visibly, and protrudes, the features and external form of the tumour, gradually changing, without any sensible cause; and so peculiar is the secretion of each species of vascular structure, according to the original destination of the part, that in one part of a tumour is generated bone, in another gristle, in another gelatinous effusion; while in another part, the vascular action is violent and destructive, and the solid bone, marrow, and surrounding membranes, are all resolved into a foul and fetid suppuration. From the periosteum is secreted bone; from the marrow, this steatomatous and solid fat, with which much of the tumour is filled; to the tendinous and aponeurotic parts we can distinctly trace the cartilaginous secretion; and the gelatinous effusions we can perceive, even during life, are thicker or thinner according to the degree of inflammation.

These are the external characters, and internal conditions of

a tumour, occupying any of the bones. Such tumour arises often from a bruise or fracture; sometimes from a less obvious cause, or from internal disease. The radius, for example, is fractured at the wrist, re-unites, and heals, but heals clumsily; the thickening never subsides, the pain never ceases, and though not great, is greater than what is natural to a fracture; at length a sensible tumour arises;—at first it is firm, but in proportion as it increases in size, it becomes somewhat soft and elastic: the thin plate of bone of which it is composed yielding to the distention from within.—From time to time the tumour changes its form, still increasing in bulk; on the side of the radius it is firm and solid; it bends and yields at the parts most distant from it; it is plainly bony at its basis, and as obviously cartilaginous in the extreme part of its circle; it plainly contains matter in those softer parts, where it yields to the impression of the finger: cartilaginous knobs arise, and sometimes are reddened on the surface; and at certain points the fluctuation is of such a kind as to imply, that the effusion is in part of a gelatinous nature. Thus the tumour grows and extends, with various irregularities in form and consistence; it overhangs the dwindled hand, the use of the joint is lost, and the patient, who would gladly be delivered of it at an earlier stage, has in the end no choice left; for when once it bursts into carious ulceration it never heals, the fetor is inconceivably overcoming, attended with hectic. You are also to remark, that when such disease takes place in the hand itself, the joints of each of the fingers grow out into tumours, at first of a heart-like form, corresponding with the articulations of the finger-bones; but in process of time, they grow to globular, irregular, and almost transparent tumours, still firm, or at least of a cartilaginous firmness. The whole hand degenerates into a deformed mass, discoloured, ulcerated, and fetid; from the individual knobs of which deformed mass, the points of the respective fingers project like griffin's claws, with crooked nails of enormous length.

You will conceive, I trust, from these general descriptions, an idea, not far from perfect, of the irregular forms, and internal disorder accompanying this disease: you may imagine how ill the surgeon is qualified for practice, who is not aware of these changes in the internal structure; he feels fluctuation, and regardless of the history of the tumour, of its firmness, or of its connection with a bone, plunges his abscess lancet into it, and it pours out, if he strike deep enough, a profusion of thick matter; he then believes that it will heal, but it will never heal. Or, knowing it to belong to the bone, he imagines, perhaps, that it is a firm and solid tumour, but believes that the tumour is moveable, because the radius moves along with it, allowing it to

turn; he projects an operation for cutting off this tumour of the bone, but, after a slow and painful dissection, he finds it not solid but cavernous, and full of fatty or fetid matter; he finds the bone to which he imagined the tumour attached, entirely gone, and the joint to which that bone belonged entirely open; he finds the smooth cartilaginous heads of the wrist-bones exposed in the cavity of the ulcer; and is forced, after the patient has lost much blood, and manfully endured a slow excruciating operation, to cut off the hand. Such are the lessons which experience teaches, and I have known instances where the case and all its probabilities have been maturely considered, by men of great skill and judgment; where a LYNN, surrounded by his approved and skilful friends, has reckoned the probability of success, such as to vindicate an operation; the tumour small, firmly attached to the radius, turning easily along with it, not yet distorting the tendons, not yet interrupting the use of the hand, I have known the operation, performed even by such an operator, fail. Now, in such cases, the tumour does not cease to grow, the incisions heal up, the part of the radius cut out by saws grows again, the tumour continues to increase, till it destroys the wrist, the hand dwindles, the fingers grow long, shapeless, and powerless, from want of use, and amputation is, in the end, the only resource.

The forms of this disgusting disease, which never fails to destroy the limb, are infinitely various. I have seen the ankle of a woman, from a very slight accident, fall into this disease; the tibia and fibula grow into a common tumour; the bones seemed to me annihilated, and a large shell of bone substituted in their place. The leg, in the course of the disease, twisted round in a singular manner, and the limb enlarged to the size of the pillow of a settee. This woman died of hectic, from the open carries of the tumour. The wrist, more exposed than any other part to sprains and fractures is, very liable to be thus deformed and ruined; but the hand itself is still more liable, the original injury is some slight blow or sprain;—one finger is first deformed, joint after joint enlarges, one finger becomes crooked after another, the nails project unpaired like talons, and force their way into the very flesh of the swelled and ulcerated hand, which they sometimes actually penetrate through and through; the hand degenerates into an unwieldy and irregular mass, studded with knobs and bony tumours. From a neglected fracture of the collar-bone, I saw once in a stout young man, who, living a most dissolute life, left the fractured part no rest to heal and unite, a tumour formed, partly bony, partly cartilaginous, rising to the height of six inches, round, insulated, moving when the arm was moved, too large and too criti-



cally seated over the axillary artery, to admit of extirpation. and which, I doubt not, has by this time become carious, and occasioned his death.

The stage and period of growth at which such a tumour may be extirpated, if ever such operation be practicable, I profess not to know : the circumstances must be very favourable indeed, to incline me to undertake such an atchievement ; it is often indeed a matter of doubt, whether it would be advisable even to amputate the diseased limb, for occasionally we see both hands thus diseased, and often the tendency to form such tumours seems to prevail through all the osseous system. If the disease proceed from a fracture or bruise, we cannot venture to extirpate the tumour, for the joint is diseased, and we have no resource but amputation : if the tumour is spontaneous, and without any violence or manifest cause, we have reason to fear it is a constitutional, and not a local disease; and dare not propose amputation with confidence ; it is only in the rare occurrence of a bony tumour being altogether limited in its growth, insulated in its form, solid and firm, and unaccompanied with disease of the surrounding parts ; seated on the shaft of the bone, not connected with the joint, and yet growing to a great size, and threatening destruction, that we should think of any such operation. Such, perhaps, is a case recorded by Heister, of a great bony tumour rising from the middle of the sternum, equal in size to a child's head, which was successfully extirpated.

The general description of this disease, and the chief practical lessons, will be as fully illustrated by the following case, as by a hundred such, for it includes all the principal features of the disease, and all the practical difficulties, which the surgeon may have to encounter.

“ A labouring man, about 40 years of age, sallow, lean, and meagre, presented himself with a tumour of an enormous size, and of an anomalous character, partly solid, partly cartilaginous, occupying two thirds of the fore arm, from the wrist upwards : the hand was sound, and all its joints limber, the wrist bended, and the fingers moved easily ; it was from pain only, and weakness, and the incumbrance of so great a tumour, that he could no longer work : the tumour seemed also to move freely, whence it seemed possible to dissect it away, and save the joint ; and the surgeon, a man whom I respect as a man of learning, skill, and consummate prudence, was induced to begin a partial operation, a dissection of the tumour, from a sincere desire to preserve the right hand of a poor labourer.

“ But here you are to take notice, (and I should put no value on a case which did not convey some practical lesson) how un-



expectedly we are sometimes involved in great perplexities from reflecting too slightly on the nature of a tumour: a tumour of this singular complexion, any tumour indeed which requires an operation, should be so particularly examined, as to enable the surgeon to prognosticate every thing that could occur, and to describe the disease before amputation, as precisely as if it lay already dissected before him: much of what will be found on dissection may, in almost every case, be anticipated, and every such anticipation will be happy for the patient, and creditable for the surgeon. The surgeon should, at least, ascertain the general character of the tumour, yet, I question whether, in this case, it was absolutely known, that the tumour was at all attached to the bone; that it was merely a tumour of the radius, assuredly not.

“ Little is to be learnt, even after much inquiry, from those of the lower orders concerning the early stages of their diseases. This, perhaps, was of a nature originally malignant, but certainly irritated by neglect at first, and, in the end, by imprudent advice and rash applications: the man had, about six or eight months before applying for assistance, first observed the disease, in the form of a circumscribed swelling, rising upon his wrist, gradually increasing, and becoming daily more painful: he imagined it right to apply poultices, and, after some time, brought it happily, as he imagined, to a suppuration: but, as it did not heal, a mischievous old woman undertook the cure, cramming it with tents, and acrid and corrosive powders, and making so very free with the lancet, that he narrowly escaped dying of a hæmorrhagy, caused probably by the erosion, or wounding of one of the veins above the wrist. The tumour was, at the time of the operation, enormously large; it was at the lower and bigger part of a dusky brown, but at its upper and smaller end of a fresher colour, with a wide and open ulcer, bleeding at times, and disposed to throw out a luxuriant fungus, to suppress the growth of which was, perhaps, part of the old woman's intention, in applying the escharotics, if intention of any kind can be imputed to so ignorant a creature. The veins, as is usual in bony tumours, were far from being conspicuous even in this part.

“ This poor man, having willingly assented to any operation, however lingering or painful, which might save his hand, the dissection was carried all round the tumour and into its central parts, before the surgeons present were undeceived. As the radius turns vertically like a spoke or spindle, it turns without any apparent motion, except in the parts connected with its lower end; the hand turns freely along with the radius, so that we never suspect till we become acquainted with anatomy, that it

is by the spoke-like motions of the radius that the hand moves ; it seems moveable in itself by its own immediate joints. This tumour, in like manner, moved easily, could be turned upwards and downwards, so that the surgeon never once suspected that the motion was in the radius, or that the tumour was fixed, and made a part of that bone ; it seemed moveable, and he began to extirpate it, by drawing a long incision round its root, on the side of the ulna : but, finding it difficult, with this limited incision, to dissect the tumour, he prolonged the incision, continuing it over the back of the hand to the knuckles, in the direction of the extensor tendons. He then dissected more freely, and continued separating the skin from the tumour, till he came to a thick and solid sac, which seemed to consist of muscular and ligamentous fibres.

“ He continued this dissection, separating this thick and solid sac from the interosseous ligament, till he could go no farther ; finding that it terminated then in a solid and osseous basis, he now plunged intrepidly into the heart of the tumour. In cutting into the heart of the tumour he found that he had opened a very large sac, not firm only, but osseous : but still as he was penetrating into the tumour at one side, viz. at the side nearer the ulna, with which the tumour was manifestly unconnected, and at the greatest possible distance from the radius, from which the tumour in fact arose, he continued still unsuspecting, and persevered in dissecting away what he imagined to be a common tendinous sac, ossified only at certain points : he made thus a large opening into the tumour, felt its cavity full of loose and fatty bodies, pushed his finger under the extensor tendons into the deepest part of the sac, began to hook out the fatty tubercles with his fingers, and, at last, baling it out with his hand, (for the cavity was large enough to admit his hand) hooking with his finger and catching the fatty masses in his palm, he so far emptied the cavity as to be able to search with his fingers in every direction, and then he found, to his utter confusion, the ball of the carpus, (formed by the scaphoid and lunated bones) at the bottom of the cavity, bare : he was now for the first time, undeceived, and knew what sort of disease he had to contend with ; he was now conscious, that the radius was diseased, the joint ruined, the original bone ulcerated and destroyed ; he felt distinctly that the ball of the carpal bones, originally opposed to the lower end of the radius, was now, by the destruction of the radius, left naked ; and, in fine, that the wrist-joint was irrecoverably ruined. There was no going on with this operation, and no stopping here ; he therefore explained to the patient, who had borne this severe and long protracted dissection with great composure, the necessity of amputating his hand, which he submitted to with equal resignation.”

The reflections naturally arising out of this case are obvious and impressive; we must be conscious how suddenly a surgeon may, in a moment of thoughtless security, be plunged into circumstances extremely perplexing. How becoming it is to investigate and examine with care, the history of every disease before operating, and to ascertain the soft or solid, the fixed or moveable state of a tumour, its probable connections and eventual dangers: we should be aware of attempting (which is indeed equivalent to promising) to extirpate a tumour, which, though apparently moveable, is only seated on a moveable bone: we should be careful not to promise a cure where, perhaps, the joint is destroyed: not to enter upon a painful and exhausting operation, in a case where nothing but amputation can avail. In a case, such as I have just described, it should be recollected, that the metacarpal bones lie very deep in the hand, have a considerable latitude of motion, and may communicate that motion to the tumour; the circumstances of this tumour and its history, were such as might deceive the most circumspect; the turning of the radius conveyed an idea of the tumour being moveable; the elastic and cartilaginous feeling, that it had nothing extraordinary in its nature; the sac, when the surgeon had dissected down to its root, was such as gave him reason to believe it was but in part ossified; the fat which he scooped out from its cavity, that it was merely a steatome; it was not till he felt with his finger the ball of carpal bones naked, that he knew the joint to be diseased; he had every apology for his mistake, for, in a disorder of no more than six months duration, he had no reason to believe there could exist such universal destruction of the joint and of the radius.

But a charitable endeavour to save the hand of a poor and labouring man, even when it involves us in a severe and fruitless operation, is not the worst error; the surgeon, alarmed by the uncouth appearance of a hand deformed by such disease, and not calculating with due deliberation the individual bones that are affected, might rashly amputate the whole hand, where an useful part of it might be preserved. Among the cases of this nature that stand recorded, is one by Severinus, short, indeed, but not the less interesting: "Hyeronimus Damianus, a youth about twenty-two years of age, crooked and scraggy, and of a puny habit of body, had his right hand so enlarged as to be a burden too great for him to bear: in lying, he laid it above his head, walking, he carried it with difficulty on his other hand: it was diseased, chiefly by the enlargement of the phalanges of four of the fingers; the individual tumours you would have likened, in respect of size, to lemons, in respect of colour, to rotten apples, being large, globular, and livid: these knobs,



or enlargements, were plaited over each other, and the points of the nails projected like claws from the extremities of the several tumours." Men of ordinary genius and resources no sooner stumble upon a difficulty than they are alarmed, and fear magnifies every danger that is likely to affect their reputation or practice. Many surgeons, in a case like this, fearful lest, after a partial operation, the disease should return, would have straightway chopped off the hand. Severinus acted quite otherwise: cutting off each finger by the last joint, by which it is united with the carpus, he burnt the roots, and brought the parts to a sound and healthy cure: he thus preserved the hand, i. e. the carpus and the thumb, the form, and something of the use of the part, for such a stump antagonising the other hand, and assisting it, would be very precious. Enormous as this tumour was, Severinus had the skill and courage to save at least the patient's thumb: and we have the consolation to learn, from the case of this unhealthy and crooked creature, plainly disposed to diseases of the bones, in whom the spine was deformed, and the tumour of the hand spontaneous, that it is possible, even where our incisions can hardly carry us beyond the immediate limits of the disease, to accomplish a cure.

In the sketch of this hand, you will remark, that the bones are alone diseased, that the several knobs or tubercles represent



DRAWINGS FROM SEVERINUS.



the several phalanges or joints of the fingers; that the hand and wrist (*a*) are dwindled, while the tumours (*c. d. e.*) represent the several joints of the ring-finger, which had far exceeded the rest in size, forming the chief bulk of the tumour: the elongation of the whole hand, demonstrates the growth of the bones in every direction.

But extension such as this, especially when proceeding from the high action of vessels, must end in ulceration, which is the natural conclusion of the disease. The ulcer is fetid and carious, affecting at once the bone and the flesh, and so ruinous to the health that amputation cannot be delayed. Such, for example, is the case communicated to Severinus by LARCHÆUS, accompanied with a drawing: it seems to have been a tumour of enormous size indeed, involving all the carpal and finger-bones, very massive and tuberculous, the hand weighing no less than seven pounds; the bones were thoroughly diseased. This irregular mass breaking out in its centre (in the middle of the carpus) into ulceration, destroying not only the fleshy parts, but the bones, there ensued a hectic fever, when the man betook himself to the hospital of St. James for incurables, and solicited to have his hand amputated, which otherwise he would not have parted with, for he was a pauper, and lived by exposing this monstrous mass of disease.

So desperate do I account this kind of tumour, when accompanied with any general disease of the bones, and so loathsome are the carious ulcers, which sooner or later ensue, that I always think it a consolation when the disease is in any degree local, even though it admit not of saving the hand by any partial operation; if it allow of our saving the patient's life by amputation, I think it a special piece of good fortune. How little it was in our power to save the patient whose wrist is drawn on the same page with this of Severinus, you will perceive from the following notes of his case: "His wrist is deformed and loaded with a tumour, or rather a congeries of tumours, surrounding the joint, *knobby*, hard, immoveable, of a rocky firmness, and plainly proceeding from the bones, both radius and ulna: the arm is weakened by the tumour, the wrist almost powerless, the hand dwindled from want of use. The man is about twenty-six years of age, a weaver by trade, born with this disease, and now in a condition which hardly admits of any alleviation. This tumour of the wrist was observed even at his birth; it was then very small, and waxed slowly and gradually to its present size: from year to year the tendency to disease became more and more conspicuous, tumours successively formed on various parts of his body. The bones of his fingers, ribs, legs, are deformed with tumours of the same

rocky firmness; one of these arising from one of the ribs, is of a most singular form, projecting from the flat rib like the handle of some instrument, and sticking directly out. These various bony tumours, which have appeared in regular succession, and grown slowly, have been hitherto void of pain, and have never yet prevented his daily labour; but during the inclement weather of last winter, and taking mercury for a slight venereal affection, the tumours on the left leg, whether from the imprudent administration of the remedy, or some lurking taint of the disease, became so extremely painful, that he was disabled from work, confined to bed, and is now in the infirmary. The papillæ, or prominent parts represented in the drawing, are the apices of those rocky and firm tumours, which are somewhat pointed; and each prominent point is discoloured, so as to assume the form of a common pimple, but very fiery and red. The painful tumours of the left leg, are in like manner reddened; the whole skin investing them, is inflamed; the complexion in short of these tumours is such, as demonstrates the approach of that ulceration, which is to convert each tumour into a loathsome, fetid and carious sore."

Though I have upon my recollection many proofs of tumours of this nature, being altogether void of pain; yet, I have a prepossession, that wherever there are acute pains in the bones, there is actually a tendency to such tumours; the close connection of pains and tumours in venereal cases, vindicates my suspicion, and I believe, that when a patient speaks of rheumatism in his bones, and feels it deep-seated with oppressive pain affecting the whole limb, the disease is actually seated in the centre of the limb, and substance of the bone: of one very singular case of this nature, I find I have taken short, but accurate notes: "John M'Donald went early in life an apprentice to the West-Indies; he was then a stout young man, and in his profession, as stone-mason, had a gang of workmen under his charge; and during a period of ten years, which he spent in that climate, had suffered no less than ten successive and severe attacks of ague and fever, and had suffered much from dysentery. He is married, and has been so many years; he is a sober and respectable man, apparently fifty years of age; never had venereal complaints, never had general rheumatism, nor indeed any other pains in his bones, but that which I am now about to describe.

"He had suffered very violent pains about his shoulders and arms, but especially in the left humerus, for the space of a year; those pains had in some degree ceased, and the pain in the left arm had been little distressing, for three months, when one day, at a quarterly meeting for the regulation of a common



Fig. 1.

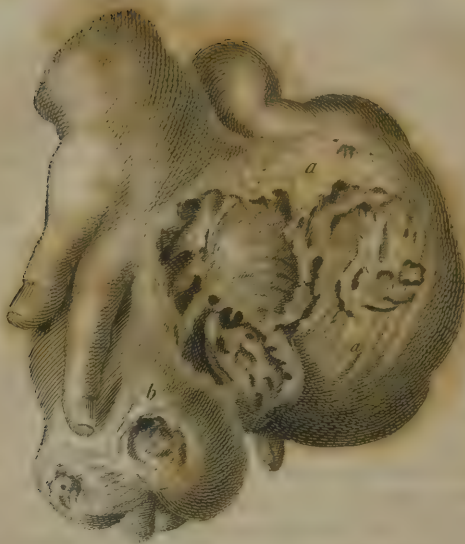


Fig. 2.





subscription fund, or society subscription for the relief of distressed members, a little girl of five years old, being in the room, he lifted her over one of the benches, and in the moment of doing so, felt a pain so sudden and acute, that he could not be persuaded but that some one had hit him a smart blow from behind, across the arm; he spoke, he says, very testily, and could not help crying out, that by that silly trick they had raised his old pain, which instantly became more violent than ever. From that moment he was incapable of raising his arm to his head; his pain, upon every occasion, of coughing, laughing, or moving hastily, is excessive: but when at perfect rest, he has no pain. From this period a swelling began to arise, occupying gradually the upper and middle parts of the humerus, surrounding it like the lump of clay and straw which is wrapped round a grafted tree." In this very singular case, I have little doubt, that the fibres at the origin of the triceps, and insertion of the deltoid muscles had given way, in consequence of the diseased state of the periosteum, and tendons, where they are implanted into the humerus, and that from such injury the tumour had arisen;—the bone, I doubt not, is carious within, supported only by this shell or new secretion; I could bend the arm gently, and could perceive that the sac of bony secretion, which at first seemed perfect and firm bone, is in part cartilaginous, and yields; the arm bends at this thickened part with a sort of elasticity: having one day committed his arm for examination to a very brutal surgeon, and turned to go away while he was thus employed, he called me back, with great exultation, to shew me, that he had been able to bend my patient's arm to an obtuse angle, so as to put the fact of the separation of the bones, and the flexile and elastic nature of the tumour, beyond dispute; a favour, which I acknowledged, I fear, in a very ungracious manner.

I have given, along with the drawing of the wrist of the man whose whole osseous system was diseased, one from Mr. Mery, of the hand of a youth of sixteen, which had attained to a prodigious size and monstrous form; it weighed, after amputation, from six to seven pounds; it was one deformed mass consisting of three protuberances of various magnitude; the largest, (*a* figure 1.) belonging to the ring-finger, appeared chiefly on the back of the hand, and was seven inches in diameter; the tumour next in size (*b*), proceeding from the middle finger, was six inches in diameter; that proceeding from the little finger, was four inches in diameter, and is seen only in the second drawing, viz. in the skeleton of the hand at (*c*). The skin, wherever it lay over these tumours, was coarse, with deeper ridges;—the surface was deformed with deep ulcers,

affecting not the soft parts only, but the bones : though from the unsightly appearance of the whole mass, it was by many pronounced cancerous, yet these sores were in truth red, granulating, and healthy ; even the deepest of them were void of pain, and the veins of the hand, usually swelled in cancerous tumours, were flat. Through the skin, which was thin from extension, the tumours felt very firm and osseous ; the lad assigned, as the cause of this monstrous deformity, the hand being bruised at the early age of six years : he was entirely well of this hurt before the hand began to grow, but it began soon after the ulceration healed to increase in size, and continued to enlarge for ten years. The hand, he had remarked, during the two latter years, had grown more than in all the eight preceding. Upon dissecting the amputated hand, the tumour was found to lie exclusively in the bones ; the greatest tubercles were merely enlargements of the first and second phalanges of the three last fingers ; those joints of the fore-finger and thumb being sound. The joints, in this instance, at the same time that they were enlarged, were motionless from being ankylosed ; but their articulations with the metacarpal bones were fixed, by the rigid state only in which the tendons were, from motion being so many years suspended. The shell of these tumours was thin, the internal parts crossed by bony fibres, cellular, and cavernous, were filled with a juice resembling the jelly of meat in colour and consistence ; and it is singular, that the carpal and metacarpal bones being but slightly affected, and the extreme phalanges on which the nails are implanted, entirely sound, the intermediate bones were enlarged to this prodigious degree. One only of the metacarpal bones, that, viz. which supports the mid-finger, was diseased, and so far enlarged as to be an inch and a half in diameter, studded with some small tubercles, and exposed in part by carious ulcers. The carpal bones were perfectly sound.

There is no case from which some lesson, more or less important, may not be deduced : all this description is interesting. The two drawings represent, 1st. the deformed and fetid mass, the enormous tumours, the roughened skin, and the ulcers penetrating into the cavities of these tumours. 2d. The skeleton of the hand, exhibiting the respective tumours of the middle, ring, and little fingers, and the heart-shaped enlargement (c) of the metacarpal bone of the middle finger, is also singularly interesting, demonstrating that the whole tumour is bone, permanent, and firm, and not an expansion of the phalanges, but a new secretion. The bone of the fore-finger was not so much diseased as deformed, dwindled in size, and bent into an arch, under the pressure of this tumour : the thin shells of bone, the

cancellated texture of the tumours, and the carious openings, are also well represented.

From this description we learn, that it is not during the period of high and violent action that tumour is generated. Matter is added to matter in the animal body by a slow process ; whereas high action terminates in suppuration, gangrene, or some violent crisis. The state of vascular action, which is slower, more nearly approaching to that of health, resembling the slow accession of disease, or the remains of high action not yet subsided, is more favourable to the generation of tumour ; for such moderated action does not injure the structure of the part, does not interrupt nutrition, allows the secretion of new parts to proceed, and, in so far as it is accelerated beyond the natural state, augments it. You will take notice that it was not while this hand was inflamed and suppurating, (for it seems to have been not merely bruised but wounded, *il avoit été guéri parfaitement de sa blessure mais peu de temps apres sa guérison*,) but after the cure was so far complete, and the increased action not yet subsided, that his hand began to swell.

This case brings an important practical question to a very short issue, for these drawings prove the local nature of the disease, viz. that it is merely in the bones, always in the heads or softer parts, that the disease is seated : that the phalanges of the fingers, which are peculiarly spongy, and the lower heads of the radius and ulna are most liable to disease. Mery confesses (without being conscious how far in that case he was to blame) that one half of the hand was apparently sound ; and that upon dissection, the finger and thumb were found in their sound and natural state.\* How then can we acquit him of rashness in smiting off the hand of a boy of eighteen years of age, with youth and health on his side, and all the world before him, when, by a less painful operation, he might have saved his thumb, fore-finger, and wrist ? Surely we may pronounce him wrong, if there be one word of truth in the case of Severinus, in which the thumb and fore-finger were saved.

Of the various questions which cases of this nature suggest, there is one which I am almost afraid to investigate. When in an adult such tumours appear, we have reason to hope that they may be local, and that, by cutting out the bone, we may extirpate the disease. Even when such tumours grow at once on various parts, we may, by circumstances, be induced to extirpate the individual tumours, and cauterize their roots ; but what shall we do when, in childhood, the disease manifests it-

\* Cependant la moitié ou environ, en paroissoit saine exterieurement, et le Pouce et l'Index dans leur état naturel.



self in various parts of the osseous system? when all parts of the bones seem (like the cellular fat of some diseased people) disposed to excrescences? When tumour after tumour appears in quick succession? and the fingers, the hands, the wrist, the elbows, the toes, the tibia, become affected? when both hands are crooked alike, griffin's claws in every finger; and when the arms and feet begin to be deformed? Shall we remain spectators of the ruin, joint after joint, of a fine healthy boy? shall we calmly look on till each tumour has acquired its utmost magnitude, suppurated, and burst into that state of loathsome carries which must close the scene? or anticipate this inevitable termination, amputate and cauterize those tumours, and eventually subject our art to discredit, and ourselves to the personal reproach of trying rash, severe, and yet lingering operations? Although, in a situation so hopeless we must be sorely tempted, yet duty and charity, I fear, compel us to refrain.

The rapid manner in which bone is secreted and accumulated to an astonishing bulk, is one of the most singular phenomena that occurs in the living body. The instance I am now going to relate will, I am sure, appear surprising, but it is selected for a far better purpose, to serve as an example of the difficulty we sometimes find, in saving the patient's life, even where the disease is local, and growth of the bone sensible and rapid. I fear too it is one of a thousand examples, of a man lost in the prime of life, and dying a most loathsome and miserable death, from the reluctance of the surgeon to charge himself with the fate of such a patient, or to predict the future consequences of a tumour while it is yet small.—It is the case of a young man, “committed to my humanity and skill,” by Dr. Forbes, of Inverness.

ALEXANDER MACDONALD, a Highlander from Fort Augustus, a tall and handsome lad, exceeding six feet in height, and uncommonly athletic, was put to the Perth Academy for his education in writing, book-keeping, and such other parts of learning as might qualify him for a counting-house, as it was intended to send him to America a clerk in the North-West Company in the fur trade. In running violently at tennis, on the academy green, he fell, and hurt his shoulder: it was such a bruise as often happens from a fall, without entailing the slightest ill consequence, beyond the first pain and swelling: the skin was blackened by the bruise, and the joint was sprained; he had excessive pain along the whole arm for twenty-four hours, but it vanished gradually:—He imagined himself well; he had recovered every thing but the strength of his arm; but after the violence of the pain, (which lasted no more than twenty-four hours,) was gone, such weakness remained, that



though, from his great strength, he could lift perpendicularly such weights as others could not move, yet he could never raise his arm to his head.

I was at pains to question his father, a respectable old man, concerning the part which received the injury ; and he clearly and decidedly affirmed, that it was not the shoulder-joint, but the middle of the bone of the arm that received the shock, it was along the whole of the arm that he felt the pain, and could distinguish the marks of the bruise. The pain had, after its first violence, totally ceased, as if the part had sustained no permanent injury, and he believed himself well ; it was exactly at the end of a month, that the pain returned, and fixed in the joint, with a very distressing sense of weakness, so that he could not raise his arm at all ; if he meant to put on his hat with it, he had to raise it with the other hand, and when thus raised, if he lowered it again without support, the moment it fell unsupported below the level, it descended like lead. Still he could lift perpendicularly a very great weight : but from this second period of pain we must date the disease. The whole arm swelled, but especially about the shoulder ; his cries and shrieks were wild and melancholy ; living in a remote part of the Highlands, it is natural for the father to express himself in the following words, which he invariably uses when I question him in regard to the degree of pain, “ Sir, there was no hour of the night nor day in which you could not hear his wild cries miles off.” He represented the particular pain, by saying, “ it seemed as if he had been bored with hot irons ; and his cries were so unceasing, as well as so piercing, that though they lived in a very long house, they had no sleep from this time forward.”

That such had been his condition no one could doubt, who saw him before his death ; for the swelling kept equal pace with these dreadful sufferings ; at first the arm seemed chiefly to swell from the shoulder-joint ; gradually the whole arm swelled, and the fore-arm and hand dwindled. His body, before lusty and strong, was wasted with the agony and want of rest. Yet even at this time, when the arm was monstrously swelled, and before it was entirely oppressed, or the fore-arm wasted, he could lift as heavy a weight with the left arm as with the right ; and even to the last stage, that in which I saw him, his hand was strong to grasp. In the first four months, the upper part of the arm had so increased in size, that the prominent part exceeded the size of his head, but now, at the end of nine months, it greatly exceeds in size his emaciated body.

When I went to receive this poor lad, I found him lying deep in the hold of a small sloop, in which he had been transported from Inverness, laid on a coarse mattress, and bolstered

up against the shelving side of the vessel ; and when the clothes were lifted, I solemnly declare, that I hardly knew, at first, what it was that I saw, which was the tumour, and which his body, or how to connect in imagination the one with the other. He lay in an inclined and irregular posture, extremely languid, and hardly able to articulate ; his head inclining to one side, the tumour, when first exposed by lifting the clothes, might be mistaken for his body ; in respect of size, it was of a suitable bulk, and when the lean, yellow, and emaciated thorax was next exposed, the tumour seemed so much to exceed it in size, with a shining surface and brilliant colour, that at first I was more confounded than shocked, so impossible was it, in the first moments, to consider of it as a tumour, or to see its relation to the arm. The fore-arm was dwindled and shrunk, and projected from the tumour at a strange and unnatural distance from the shoulder : the veins were swelled, like those of a horse's belly : large fungous tumours, as big as oranges, projected in a group from the outside of the arm, at the place where, about two months before, a large abscess had burst ; and such was the fætor of the matter running from under these fungi, and the langour of this poor emaciated creature, that I had no thought for the present, but how to get him conveyed alive to town. After a few days, when he was somewhat recovered from the fatigues of his voyage, I proceeded to write down the history, and examine the actual state of this tumour.

It consisted chiefly of bone, was little cartilaginous ; hardly in any part elastic or yielding, and discharging matter, not from any superficial abscess, but apparently from the centre of this enormous mass. I had every reason to believe, that the bone and the joint, which certainly were neither broken nor dislocated, had been generally injured, not merely by the shock, but by the bruise : that the parts nearest the bone, and connected with it by the periosteum, had been bruised and inflamed ; that the extreme pain for the first twenty-four hours, indicated only the violence of the immediate injury, but the slow vascular action which succeeded, at the distance of a month, proved how deeply the circulation of the bone was affected, and caused that osseous secretion which generated this prodigious shell of bone ; while the shaft of the humerus, from the periosteum of which this callus had been secreted, was in part destroyed by an ulcerating process within : that the ulceration, deep seated, not only in the bone, but in the joint, occasioned those excruciating tortures which were announced by wild and desperate cries, night and day : that the matter bursting at last through every obstacle, had made its way through that ulcerated part of the surface, which is studded with fungous excrescences.

This bursting out of the matter brought relief from the pain; he now lay in a state of extreme languor, moaning and slumbering; you found it painful even to question him, he was so feeble; he fell, after a few broken answers, into a slumber of mere debility, and closed his eyes as exhausted; and while I took the sketch of his posture, and of the proportions of this prodigious tumour, he slumbered continually. His extreme weakness precluded every practical experiment, and left for our discussion the speculative question only; "In a case so deplorable and hopeless, what should we have done at an earlier stage, when the patient's strength was more entire, and youth and vigour (for he was but twenty-one years of age) on his side?"

Here, for the first time, I felt that a bony tumour might, by advancing to the trunk of the body, preclude amputation as entirely as aneurism of the subclavian artery! That the question here to be resolved was not, whether we might dare to amputate at the shoulder-joint, the question was of amputating the scapula also, and along with it a tumour, exceeding in size even the trunk of the body! and the accident mentioned by Cheselden, (an accident which has often happened since) of Wood, the miller, whose arm, scapula and all, was rudely and suddenly torn from his body, could not but come into our recollection. There was hardly left us even a choice to exercise our discretion and skill upon; for, from the state of the veins, large, tortuous, and already ulcerating, and so numerous as to give a livid colour to almost all the surface of the tumour; it was plain, that he was in daily peril of hæmorrhagy, and that this was at no remote period, certainly within a few weeks, to put a period to his life! Could there then be a question, whether to wait in fear of that hæmorrhagy, which was assuredly to end in death, or to risk by operating, that hæmorrhagy by which he might be saved alive? For my part I had not the shadow of a doubt: what should determine us in any desperate case, to do desperate things? Surely the possibility of safety through operation, the certainty of death! I saw it possible, by trying first the subclavian artery, the root of all the circumflex arteries of the shoulder and scapula, to prevent any alarming degree of hæmorrhagy; by sawing across the outer end of the clavicle to get command of the scapula, and turn it back, as easily as the flap from an ordinary stump; to tie when it was cut, the arteria transversalis scapulæ, and certainly to separate the whole, without immediate death. But had this been an enterprise as certainly fatal as the Cæsarian section itself, still it gave some chance for life. Confident in the justness of this reasoning, moral and physical, I should have urged him



to this awful trial, and devoted myself to the task; but he was sunk too low for any trial, and to be regarded only as an object of charitable care. He died in the Royal Infirmary, of hæmorrhagy, about three weeks after his admission, and these are the notes of the dissection.

#### DISSECTION, July 13th, 1806.

“ Having divided the integuments, which were extremely thin, we found, on attempting to cleanse the tumour from one extremity to the other, that it was of a substance much resembling callus; in many places it was so firm and solid, that after trying in vain to divide it with a strong knife, we were obliged to betake ourselves to the common amputation-saw.

“ The cells of this bony tumour were every where filled with a matter resembling thick cheese; the tumour itself, from its great size, and the entire appearance of the os humeri, seemed only to be attached to that bone; but upon a more minute examination, was plainly a production from its substance. The humerus could be traced through the whole tumour; but enlarged, spongy, and ulcerated. The upper part of the scapula, the acromion process, and the outer end of the clavicle, could, during life, be plainly distinguished to be enlarged, and to form part of the tumour; and upon dissection, all the bones forming the shoulder-joint were found to be deeply diseased. The upper and most bulky part of the tumour, seemed to proceed as much from these, as from the os humeri, and the joint was completely ankylosed.”

There is a period in every such case, when the tumour being still of moderate size, and yet requiring an operation of the most desperate and unprecedented nature, viz. the amputation even of the scapula itself; the question must be of the most perplexing and agitating nature. The surgeon must be conscious, that the patient is to die a loathsome and miserable death; yet it is a consciousness which he never can bring home to the mind of the patient or his friends, and if he take upon himself to urge an operation so desperate, and the patient should die, the slight impressions his representations have made vanish, the danger, which was distant and problematical, has been accelerated by his misconduct; by his ill success he is condemned, and never can it be put out of the minds of the relations, that the patient might have lived, or that even the tumour might have burst and resolved into matter. But a precedent like this, and I have witnessed and could relate many, solves all scruples, and he who knows the constitution of such a tumour, its inevi-



table increase, and the loathsome end of the sufferer, will not, I believe, shrink from his duty. This case is highly interesting, as it is the direct consequence of a very ordinary mischance, of a slight fall, and a bruise importing nothing: it is not merely a prodigy to be gazed on, but an important precedent.

Allow me, before I forsake this interesting subject, to give you one document in practice, from the universal ignorance, or wilful neglect of which, I see every day the most dismal consequences. A bone, both in itself, and in its surrounding vascular apparatus, is as susceptible of inflammation, and while it is inflamed, or in danger of being inflamed, should be as delicately treated as the soft parts. How often, how continually you have seen this injunction reversed, I need hardly remind you: every bruised bone, and sprained joint, is rubbed and diligently moved. With an ignorant and stupid fear, of the joint losing its motion, it is wrought backwards and forwards in every direction! and whatever inflammation is begun, is never permitted to subside! Thus a military gentleman, whose humerus was diseased, with, I doubt not, an internal caries, (for I have dissected such cases, and kept in preparation very long, a shoulder-joint thus diseased internally, which betrayed no outward appearance of disease) and who had excruciating pains, a total lameness, a singular emaciation of the whole member, and who, though he could mount his horse, could not endure the motion of it, even at a foot pace, was ordered by the physicians he last consulted, along with various other prescriptions, to have his arm turned and wrought backwards and forwards by his servant with all his strength. He fainted more than once, under this discipline, and fortunately was not able longer to endure what must have killed him in the end; by completing that caries of the joint which was at that moment just remediable. He came from Ireland, and put himself under my care, and by a course of stimulant fomentations, by bandaging his arm to his side with rollers, as closely as if it had been fractured, and by renewing caustic issues all round the acromion process, and head of the shoulder, and keeping them running for six months, he is now almost entirely cured. His arm, notwithstanding the stricture of the bandages, has recovered its flesh and firmness; he can raise it now without pain, and finds that he could use it with confidence: but, I think it right for a limited term to keep him safe, with the arm slung, and without motion, till every tendency to disease is gone.

A young lady, whose arm I have been obliged to amputate, fell, at the age of fifteen, from a table, and sprained her elbow-joint. The immediate pain was just such as is usual on such slight accidents; it subsided, and there remained only that

dead and heavy pain, and stiffness of the joint, which indicates that the ligaments and periosteum are not yet relieved from the inflammation, and which requires stimulant fomentations; perhaps a caustic issue, and perfect rest: what was directed? Why, that she should carry all day long a heavy dressing-iron in her hand, to straiten the joint by the continual extension, and that she should, by frequent exertions of swinging this load backwards and forwards, with the help of a servant to twist and turn the joint, try to recover the free motion of it. This imprudence has almost cost her her life: the internal inflammation was never permitted to subside; the joint swelled, burst out in fetid ulceration; the bones and the joint became completely carious; paroxysms of inflammation, new suppurations, and weeks of excruciating pain before the bursting of each abscess, reduced her to the lowest extremity of weakness: she had hæmoptysis and every appearance of confirmed hectic, and approaching death, when a consultation dictated the amputation of the arm as the only possible means of saving her. Since the operation, and even before the adhesion of the stump was complete, she had, by pleasant sleep, and the return of appetite, recovered her strength and freshness of complexion, and is now in perfect health.

Such errors are so commonly and thoughtlessly committed, that they are as it were contagious; we do what we see daily done before us, without thought or reflection, which makes a document of this nature, on an ordinary occasion, of no slight importance to the young surgeon.

## DISCOURSE XXIII.

## ON TUMOURS OF THE NOSTRILS, GUMS, AND THROAT.

**T**HOUGH polypus is one of the most loathsome and fatal diseases, it is described in terms little suited to convey this idea to the young surgeon; who, while he reads a systematic author, or hears a lecturer talk in slight and familiar terms of the disease, and its cure, little suspects the dismal scenes which are passing in the chambers of the sick, and puts his hand with, little forethought or prudence, to operations the most difficult for a man of experience, the most impossible for an unskilful person to perform.

How this levity of manner should be explained, I have been at times doubtful, and am now perhaps uncharitable; but I could not avoid observing, that in the works of systematic writers, this appears so simple, so trivial, so harmless a disease; it is represented as so mild in its ordinary, and so incurable in its more malignant form, that the chief care of the surgeon should be, to make a just prognostic, and act with reserve and prudence. But those who have transmitted to us the most faithful records of their cases, represent a far different scene. Polypus appears, in their juster pictures, to be one of the most horrible, the most incurable diseases. In writings of systematic authors, all seems simple and harmless, and the methods of cure are trifling and temporizing. In the works of original authors, the methods are rude, violent, and unrelenting: rather than not unroot the tumour, they would burst up the cells of the face, and destroy all the bones; and they deliberately debate these questions, whether we should not split up the nostrils? trepan the antrum Highmorianum? and dig away the spongy bones? rather than fail to reach the roots of the tumour. Whether it be not allowable to perform bronchotomy, and by opening the trachea procure free breathing for the patient, while these more cruel operations are performing? This is a text, these are discrepancies, on which it becomes us to comment. Those who have heard and repeated the saying, that polypus is in general a mild disease, have of course be-

lieved that these are cases of peculiar malignity ; that there are, certain polypi which the surgeon need not disturb, and should not tamper with, and others which he assuredly cannot cure. But were this conviction ever brought home to the mind of the surgeon, then should his good offices be at an end ; surely we must not in any case pretend to meddle with a disease, which, if mild in its species, we should not irritate ; which, if malignant, we cannot cure ? But I have some experience in this line of practice, and some judgment in this department of reading ; and have strong suspicions of something wrong, if not unfaithful, in these opposite representations. Polypus is never mild, nor ever malignant ; time, and the natural growth of the tumour, and the pressure it occasions within the soft and bony cells of the nostrils and jaws, must bring every polypus to one invariable form, in its last and fatal stage. Those who are employed in recording cases on unquestionable facts, give us the true and only picture of diseases, they speak of none which they have not seen ; but systematic authors, obliged to explain each disease in its order, give descriptions of diseases widely distant from truth, describing what manifestly they have not seen, and explaining, without the slightest remission of their wonted confidence, what they have not learned and cannot know. Whatever you might learn, (yet that would be in an irregular and dangerous way) from books of cases, be assured you might read those systematic authors, (which I might name, I hope, without envy, and which I allude to without malice,) from sun-set until sun-rise, without conceiving the very slightest notion of the disease of which I am now to speak.

Polypus is indeed a dreadful disease ; but like every other, it becomes so by a slow progression, and advances by gradations easily characterised, and which you will do well to mark. It is described as “ a small and pendulous tumour, projecting in the nostril, void of pain, attended with no worse symptoms than watering of the eyes, and sneezing, sometimes soft, sometimes firm in its texture, and moving backwards and forwards with the breath. You would imagine nothing more simple than to noose such a tumour with a thread, or pull it away with forceps.

And so indeed is every polypus in its early stages, a small, tight, and moveable tumour, attended with sneezing, watering of the eyes, swelling in moist weather, descending with the breath, but easily repressed with the point of the finger, void of pain, and in no shape alarming ; and it is easily extracted too, so as for a time to clear the passage for the breathing ! Yet this little tumour, simple as it may appear, is the germ of a very fatal and loathsome disease ; and this easy extraction, the



very cause, often, of its appearing in its most malignant form : the more easily it is extracted, the more easily does it return ; and whether carelessly extracted, or altogether neglected, it soon returns ; and when it does return, it has not in truth changed its nature, it has not ceased to be in itself mild ; it is then to be feared, not from its malignity, but from its pressure among the delicate cells and membranes of the nose : it soon fills the nostrils, and obstructs the breathing, and causes indescribable anxieties : the patient lies all night with open mouth ; during sleep he is harrassed with fearful dreams ; and when he wakes his mouth and throat are parched and dry. The tears are obstructed, and the eyes become watry from the pressure on the lachrymal sac ; the hearing is in like manner injured, by the pressure of the tumour against the mouths of the Eustachian tubes ; the voice is changed, and its resonance and tone entirely lost, by the sound no longer passing through the cells of the nose and face ; the swallowing is in some degree affected by the tumour depressing the soft palate ; the pains arising from such slow and irresistible pressure are unceasing ; from the same pressure the bones become carious, and the cells of the face and nose are burst up by its slow growth.

The tumour, in no long period, begins to project from the nostril before, and at the arch of the palate behind ; one nostril grows wide and thick, the nose is turned towards the opposite side, and the whole face, in consequence of a rising of the cheek-bones, becomes oblique ; the root of the nose, where it is set off from the forehead, swells and becomes puffy ; the features tumid and flabby, the face yellow, and the parts round the eye, livid : the patient is affected with headachs which seem to rend the bones asunder, and with perpetual stupor and dozing : the bones and membranes now plainly ulcerate ; a foul and fetid matter, blackened with blood, distils from the nostrils, and excoriates them, and by passing partly down the throat, occasions diarrhœa : the blood-vessels next give way, and sudden impetuous hemorrhages weaken the patient ; the teeth fall from the sockets, and through the empty sockets a foul and fetid matter issues from the antrum.

Now the disease verges towards its conclusion. The patient, conscious that the tumour, lately so mild and moveable, has degenerated into a mortal disease, is resigned to his fate ; and no flatteries of his friends, nor soothing words from his physicians, can longer deceive him : in the night he starts from his sleep, in horrible dreams, and with a sense of suffocation ; and frequent hemorrhages bursting out from time to time, reduce him to such extremity of weakness, that for several days he is not able to crawl from his bed ; and when he rises from it, he

hangs over the fire, cold from loss of blood, pale as a spectre, his lips colourless, and his face like wax, yellow and transparent : he hangs his head forwards, resting it on his hand, and moving it incessantly from side to side, from the intolerable pain, the saliva distilling from his mouth, and the foul matter dropping from the nose : in this state he survives a few weeks, desolate and hopeless. During the last days of his illness, he lies in a state of perpetual stupor, and dies lethargic.

Never can you thoroughly know this part of your profession, nor arrive at a just sense of the danger of this disease, till you have seen your patients thus suffering and dying ; nor have you, from systematic books of surgery, the very slightest intimation, that scenes like these are passing in the chambers of the sick. Perhaps, it will be said, (I wish it could be justly said) these are very exaggerated pictures ! they are, on the contrary, so very faithful and true, that I, who have witnessed them many times, know not how they can be exaggerated : I have traced, as simply as I could describe, with any regard to truth, the phænomena of this disease, from the stage reputed harmless and mild, to that reputed malignant. If, indeed, horrid symptoms could establish the fact of malignity, that there is not to be found in all nosology a more malignant disease than this : but aneurism, though it destroys the thigh-bone, the sternum, or the cranium, is not accounted malignant ; neither is polypus malignant, though it destroys the cells of the face, and penetrates even through the ethmoid bone, to the brain.

I shall demonstrably prove to you that polypus is a tumour in itself indolent and harmless ; that it is no farther malignant than as it does, by universal and irresistible pressure in the latter stages, destroy the bones : that circumstances determine the growth, and the more or less rapid growth, determines the fate of the patient : and I shall, I doubt not, prove to your conviction, that it is far better to suffer the salutary pains of operation and caustic, than the unavoidable tortures of a disease, which, as soon as it becomes painful, is incurable. You are, by every law, moral and professional, bound to continue your good offices to your patient, while he consents to suffer, or there remains the slightest hope of success. While the doctrine of benignity and malignity (and these terms are repeated in every page of Pott and other writers) is acknowledged, while the surgeon pronounces every incipient polypus mild only, because it is small, and as yet harmless ; and every polypus malignant which has attained a conspicuous size and more solid texture, and begins to affect the bones : while he neglects the beginning, and shuns all concern in the lamentable conclusion of the disease, no patient's life is safe.

Yet, with all these distinctions of mild from malignant polypi, and endless injunctions not to tamper with the disease, no author can refrain from praising that operation, whether by ligature, forceps or caustic, to which he is most favourably inclined; and in such familiar terms are the several stratagems for reaching the roots of the tumour described, that I know not how the young surgeon can escape a deception so naturally suited to the complexion of an ardent and inexperienced mind. It is impossible to read the boundless commendations lavished by each author on his own peculiar operation, without being persuaded of its efficacy, and imagining besides a thousand other ways, the least perfect of which will equally succeed: but there is a sad disappointment when we put those inventions to the test of actual practice. Instruments and methods of cure have been imagined in the closet, by men who have not even introduced a finger into the nostril, much less felt the infinite difficulty of casting a noose round a polypus; and the result is, that, while these methods are very seemingly perfect, declared by their inventors to be infallible, and allowed by all to be ingenious, they are altogether unavailing when put to the test. The young surgeon finds these practices so described in books, that he thinks of nothing but the admirable ingeniousness of the invention, nor can he admit a doubt, that he can introduce his probes, his tubes, and his catgut or wires, so as to noose the tumour: but when he goes to grapple with the actual disease, and while he is struggling to apply his wires, the nose is streaming with blood, the patient staring and struggling as if in the act of suffocation, the tubes and forceps are thrust perseveringly into the nostrils and throat, the forceps are next driven deeper into the nostrils, the blood streams again, and the pendulous parts of the polypi, which are more prominent in the nostrils, are bruised and mangled, while their roots are left entire, and only fragments of the tumour mixed with the clots of blood, are found upon the clothes. The patient terrified, sickened, and spent with hæmorrhagy, prays for some suspense of his suffering, at the moment when the surgeon begins to be abashed at his ill success; he desists, for awhile, from farther violence, but the same unsuccessful operations are repeated from time to time, and if but the slightest breath of air pass through the nostril, he takes advantage of that seeming success, and introducing bougies, or a thick roll of lint, persuades his patient that his condition will improve daily. But the patient, after a season spent in vain and miserable endeavours to preserve the nostril free, returns to town with carious bones, deformed features, a projecting polypus, a frame exhausted with suffering, and especially exhausted by suffocation and want of



sleep: his life is threatened every moment by impetuous hæmorrhagies, and he is plainly beyond the help of better surgery.

God forbid that I should impute such negligence to a desire of gain, or contempt of duty, to a haste to succeed, or a vain desire to appear successful. These are the consequences merely of a deception, which no one who takes his ideas from books can well escape. The operation of noosing a nasal polypus, which I shall prove to be altogether futile; or that of extracting it with forceps alone, which I know by experience never can be perfect or successful, are yet represented as perfectly effectual. The operation of noosing a polypus is one which the young surgeon is taught to perform with all the ceremonies and circumstances of an operation; and if it is but so performed, that the wire or ligature does not immediately drop away, all the instructions he has ever read or heard of, seem to be fulfilled, though the tumour begins to project again in a few days. He believes the cure of polypus to be an operation to be accomplished at once, by a coup de main, while in truth it is a cure to be accomplished by various and persevering methods. The operation of noosing or extracting a polypus is far from being a splendid piece of surgery, fit to be exhibited in an operation room. I have never known an operator put on his sleeves, and address himself to the work with those mistaken notions; and in the hopes of visibly unrooting the tumour with the forceps, or entangling it in a noose, who did not retire from the scene with confusion and dismay. The horrid scene which ensues, the quick re-production of the tumour, and the caries of the bones, is not the effect of tampering with a malignant disease, but the natural progress of a tumour uninterrupted by operations so imperfect and mal-adroit. Let no man attempt the cure of this disease whose sole purpose is to shine as an operator; who has not perseverance and diligence enough to try, successively, every method, and humility enough to be contented with the happiness of saving his patient by any means.

I verily believe, that none are more innocent than those who deceive us by commending such trivial operations, for they first impose upon themselves. They invent an instrument or method indisputably ingenious, and with all the simplicity in the world imagine, because it is ingenious, that it must be useful. I believe the very reverse of this might be proved by all past experience, in respect to surgical inventions; for the most curious and ingenious have invariably proved the most inefficient; and, if passing over the first inventor and his eulogiums, you inquire of the next who tried the instrument, you find it quite useless; or, if one have performed the operation, and it be left



to another to report its success, the reverse is sudden and mortifying. Speaking on this subject, I cannot help laying before you one example of this, to me the more striking, as I remember how much I was delighted when a boy, with the piece of mechanical ingenuity which I am now going to explain: so much was I delighted, that in my admiration of the author's genius I contrived to forget his ill success. The operation is related in the third volume of the *Edinburgh Essays, Physical and Literary*. "A man of the name of Davison, very far advanced in years, was admitted into the Royal Infirmary, with a voluminous polypus, which had its root near the epiglottis, lay within the œsophagus, and was occasionally vomited up, when he was excited by emetics, or by thrusting the finger into the fauces. The polypus then occupied the mouth, extended to the fore-teeth, and appeared to consist of four distinct lobes, arising from one root or neck. But the polypus, while it thus occupied the mouth, prevented the breathing of the patient, by covering the opening of the trachea; wherefore, having just shewn it to his surgeons, by vomiting it up into the mouth, he was obliged presently to swallow it down again for want of breath. His speech, his swallowing, and his breathing, were all so affected by this very voluminous tumour, that it became a very interesting question how to extirpate the tumour: and it was proposed, that while the operation of bronchotomy was performed to give him breath, the noose, by the help of some very ingenious useless machines should be cast over the tumour, which latter part of the scheme was fulfilled in the following manner: a ring, mounted on a stalk, and having the thread designed for ligature concealed within the circle of the ring, was pushed down into the fauces: the pushing down of the ring excited the patient to vomit, and the ring so occupied the fauces, that when the tumour was vomited up it was driven through the ring; the ring was then pushed harder down towards the root of the tumour; the ligature was then drawn tight; other instruments with wheels and pulleys for passing a double ligature (the single one not succeeding) were next invented; and finally, the purpose was so effectually accomplished, that the polypus was strangled: he passed, by stool, lumps which he mistook for clots of blood; but he passed also along with those, the loop of the ligature with which the polypus was noosed." It is, in short, insinuated in the surgeon's narrative, that the patient had passed the bulk of the polypus by stool; and it is directly affirmed, (by Mr. Dallas, the operator) that "having, at the end of the month, sent for the patient and examined his throat, and made him vomit, nothing preternatural appeared; and that, having presented himself at the dis-

tance of eight months at the infirmary, on account of a common cold with which he had been lately seized, he, upon being examined, *seemed to be entirely free from any ailments of the polypous kind.*"

Such, and so circumstantial is the narrative of this ingenious invention, and of its success ; and it is supported by all the usual apparatus of names, dates, consulting surgeons, operation-room, students, &c. Hear now how a plain tale puts this down ; hearken to the fate of a poor soul (in the month of April, 1765) who was declared thus entirely free in April 1764 "of all ailments *of the polypous kind.*" "I was informed," says Dr. Monro, "that James Davison had died in the Royal Infirmary, to which he had returned a few weeks before that, very feeble and emaciated, as for several months past he had not been able to swallow any solid food, and even swallowed fluids with much difficulty ; the polypus had not however been seen by the surgeons who had examined his throat.

"On dissecting his body, the œsophagus was found to be greatly dilated, by a very large fleshy excrescence or polypus, which grew out from its fore-part, by a single root, about three inches lower than the glottis, but was split at its under part into several lobes, the largest and longest of which reached down to the upper orifice of the stomach." So untrue is the tale told by a man who never designed to deceive ! Judge, then, how dangerous it is to believe, where there is no other evidence than that of the inventor, and where the cunning of the mechanism is so apt to pass for a demonstration that it must be successful. Believe me it is safer to doubt ; it will be found by all past experience, that the most ingenious and complicated schemes are apt to fail in exact proportion to the seeming ingenuity of the invention. I can venture, on my own authority, to assure you, that the ring of Hildanus, the tubes of Levret, the probes and other instruments by which, as later authors assure you, it is so easy to apply the noose, and slip it up to the very root or pedicle by which the polypus hangs ; the very instruments and methods which you have taken most delight in practising, will fail you.

I am now to enter upon the anatomical investigation of this subject, and to speak of the origin, form, and effects of polypus ; a subject which will admit of no conjecture ; of the manner in which the tumour presents itself in the passages of the nostrils and throat ; and how it may be successfully grappled with, a subject surely of the highest importance to the practical surgeon.

I affect not to purge the science of every prejudice, but those which have a direct relation to our subject in any practical

sense, I like to treat of freely. That a small and apparently trivial tumour of the nostril should be ascribed to the common and unseemly practice of picking the nose, is far from being particular; and were this reported merely to frighten boys from unseemly practices, I should feel little disposed to refute it. But there is a most dangerous prejudice connected with this error, viz. that the polypus is not only tangible, but its root accessible to the finger, since caused by the intrusion of it. The most impatient finger could never reach that part of the nostril where polypus has its seat, for that is deep and high in the nostrils, towards the throat, and near the openings of the Eustachian tubes. The finger can be admitted no deeper than the cartilaginous wing of the nose extends, and can hardly touch the anterior point of the lower spongy bone. The anterior and posterior chambers of the nostril are separated from each other by a narrow slit, which the finger can never pass; this opening is somewhat of the carved form of the slit in the sounding board of a violin, and the intrusion of the anterior point of the spongy bone, which is the point that encounters the finger when thrust into the nostril, gives it this peculiar shape. There is a little opening above, and another below this projecting point of the spongy bone; through these the heads of the polypus project; one generally fills the opening above the spongy bone, another polypus usually fills the space below; there they hang pendulous, and are forced sometimes through this opening by the breath pushing them down very low; at other times they are retracted by drawing in the breath; but how very distant this tangible part of the polypus is from its root, and how long the tumour usually is, I shall next prove to you. The very proof of this is dissection; and if what I have described be true, you will find it obvious in the drawings, to which I next appeal: in these you will observe, that all the polypi are long and pendulous, and only bulbous at the extremity where they are felt with the finger. You will observe, that in consequence of their great length, the roots are at a great distance from the pedicle or stalk from which they grow, that their bulbous extremity cannot be felt at all times, their roots never, for they are in the highest and narrowest part of the nostril. You will observe, that polypi, which, were they produced by picking the nose, or any local injury, would be solitary, are, on the contrary, numerous beyond any conception you can have formed\*.

\* It is by no means a matter of slight importance to ascertain this point. We know by dissection, and by much sad experience, that polypi are rarely solitary; that the whole membrane is diseased, that both nostrils are frequently affected; that the cells as well as the passages of the nose and throat are studded with polypi of various sizes. The melancholy case which I am now to transcribe, or rather to



Polypi hang forwards in the nose, in a direction so unfavourable to their being noosed, that I see it, from the preparation,

PLAN NO. 1.



epitomise, from one of the most celebrated writers on this disorder, is a proof how rarely it is local, how impossible that it should be produced by picking the nose or any such injury, how universally the membrane is diseased.

"A young man," says Manné, "of twenty-seven years of age, died at La Charité. Three years after having the small pox, from which period he had



as improbable, as I have felt it in practice impossible for the young surgeon to succeed in noosing them; and a practical fact is the point to which I shall particularly call your attention; yet let me acknowledge, that it is by experience alone that I have learned how difficult it is to noose that lesser polypus which hangs forward in the nose. Had I sat down, like many of my betters, in the closet, to contrive ways of noosing such a tumour, I could have imagined nothing more likely to succeed than the common process. I no more doubted than others, that the method which I found so ingenious, when described in books, could fail me in the act. Allow me to explain, first the Plan No. 1, from which you will learn the actual circumstances of these kind of tumours. Secondly, The plan, No. 2, which will illustrate this indescribable and unforeseen difficulty of noosing them. In this plan 1, fig. 1, you cannot but remark, that the three polypi, with which the nostril is filled, the largest marked (*a*), the next in size, (*b*), and the third, (*c*), hang from a point very high in the nostril, and very far back, that their roots must be in the posterior end of the upper spongy bone, under the socket of the eye, and not far from the opening of the Eustachian tube. Of this you will be satisfied by looking to Fig. 2, taken from the same preparation, hanging still by the same thread, only turned round, so as to shew the

been afflicted with polypi in the nose; a whole hot-bed of them (says the author), if I may be permitted to use the term, appeared. He had in the passages of the throat and nose, in the antrum maxillare of each side, and in the frontal sinuses SEVEN POLYPI in all. His face was shockingly deformed; he had a great bulging at the root of the nose; his eyes were removed from each other, by the swelling, to three times their natural distance, and seemed bursting from their sockets; the nostrils were expanded, and the nose flattened and extended; while the cheek bones were raised to the level of the nose, and the face and head swelled to an enormous size. The ears were obstructed on either side; the tears flowed over the excoriated cheeks, and sometimes fetid pus burst out from the fistula lachrymalis on either side.

"While his head and face were thus externally deformed, the palate of this miserable creature was so depressed that it lay upon the tongue, and bulged so, that the lower jaw was depressed; the mouth kept perpetually gaping, so that the saliva distilled continually from his jaws, while the nostrils were distended by the bulbous extremities of two larger polypi.

"In dissecting his head these polypi were found to have occasioned great devastation; the cheek was laid open by a crucial incision, and the upper maxillary bone seemingly annihilated, nothing being left of the walls of the antrum but a thin scale like the peeling of an onion: on opening the opposite cheek they found the antrum burst open in a star-like form, and on dividing the delicate membrane which closed this breach in the antrum, a thin and bloody serum exuded, and there projected from the cavity a small portion of a very firm and elastic polypus of a red colour; and when, by cutting and tearing away the rest of the bone, the tumour was found very large and quite insulated, except at its neck, which was of such dimensions as to be easily embraced in the circle of the fore-finger and thumb. It resembled a turnip in respect of shape; its lower end was bulbous and large; but its pedicle, or immediate attachment, was so exceedingly delicate that it seemed difficult to imagine how so great a tumour could grow, or even be nourished, when formed, by so small a root. It was no more than one line (the

back of the nostrils; and here the same iron probe (*d*) is left in the nostril. You may see how this nostril (the right one) is dilated by the polypi. The septum or partition of the nostril (*e*) is inclined, by the pressure, towards the left. The posterior opening of that nostril into the throat, marked (*f*), is greatly dilated; nor must you wonder at this, for the tumour was once large and bulky. Tumours which, in the dead body, are flat, long, and corrugated, by long immersion in spirits, may not only have filled, but distended the nostril, and dilated it permanently: (*g*) marks the centre of the septum greatly inclined to the left, and (*h*) marks the mouth or opening of the Eustachian tube; the tumours taking their origin betwixt this and the nostril, marks the point of their origin to be the upper spongy bone; and the patient suffering deafness from the pressure of the polypus against this opening, shows, that slender as the tumours appear in this preparation, they had, when the patient was active, and the blood in full circulation, been sufficiently bulbous to occupy the whole circle of the opening, (*i*): (*k k*) marks the whole length of that slit-like opening, betwixt the septum and spongy bones, which the finger can never pass, and which, from its narrowness, occasions the chief difficulty in managing instruments of any kind, and especially those tubes

twelfth of an inch) in diameter, and of the same length. The coat of the tumour was smooth, delicate, not irregular nor warty; its substance was lardy, and the bottom of the cavity in which it was lodged formed one half of that concavity of the palate which pressed upon the tongue. On opening the antrum of the opposite side, they found it occupied with a tumour expressly similar in all points and circumstances, in size, form, consistence, and colour, and in its effect upon the adjacent parts. Upon opening the two frontal sinuses there was found on each of them a tumour of half the size of those which distended the antrum. These also had each its delicate pedicle, which grew from the margin of that little hole by which the frontal sinus of each side communicates with the nose; the partition betwixt the sinuses was destroyed, thence they formed but one general cavity; from this cavity, as from the antra Highmoriana, a little of a yellowish serum issued, upon their being opened; and here, as in the antrum, the pituitary or Schneiderian membrane was much thickened. These tumours were spherical, but the mutual pressure of the tumours had flattened each upon that side when it encountered its fellow. To have a more perfect view of the effects of this pressure on the adjacent parts, they were obliged to dissect out the eyes, and then it was seen that the eyes were displaced by the pressure of these tumours which had made the inner side of each orbit bulge outwards; and upon opening the skull they found that a thin protuberance had actually compressed the brain, for the two hollows of the os frontis were convex and pressed so inwards, that betwixt them the crista galli was entirely concealed. Upon opening the throat behind the palate, three tumours, seemingly arising from one pedicle, were seen projecting into the fauces.

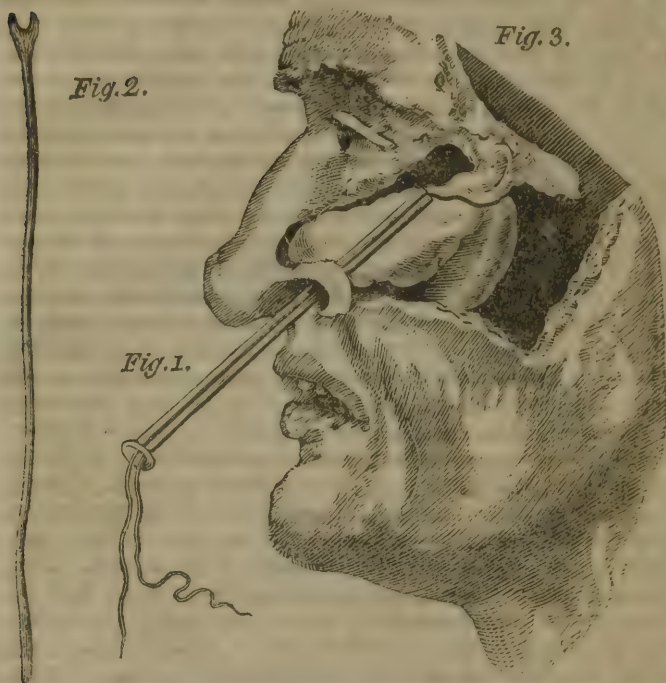
"This may serve as a general analysis of this unhappy case, and must suggest a doubt whether it may not, in circumstances, be allowable and laudable to attempt the desperate, yet harmless operation of trepanning, or rather cutting open, with a strong scalpel, the frontal or maxillary sinuses, distended, softened, and become carious by the long pressure of such enormous tumours. It is lamentable to observe how unavailing every kind of operation must be where the tumours are thus numerous, and in how short a period it runs its fatal course."

and probes which I am next to describe. But while I am making these observations on the drawing, you cannot but remark the proof of those peculiarities I have already taken notice of, viz. that polypus is not solitary; on the contrary, that the predisposition is so strong, that three or four polypi are often crowded in one nostril, a circumstance extremely unfavourable to the operation of the ligature, which, though in itself effectual, would, in a case like this, fail; for it would, in such a case, require to be applied three successive times; after each operation the breathing would be again interrupted; a tumour lying deeper would re-place that which was extirpated, which would thence seem to grow again in a few days; for one tumour only is seen at once; a second presents itself as soon as the nostril is cleared of the first; tumour after tumour presents in succession, and the operations seem endless and quite ineffectual. Besides, while the polypi are numerous in one nostril, it rarely happens that others are not formed or forming in the other, which are also numerous. Polypi are usually found at the same moment fit for operation in both the nostrils, as appears in the right nostril of this preparation, where (*kk*) represents a polypus long and flat, resembling one of the nymphæ in shape, and hanging from the upper spongy bone (*l*); for in this preparation (*m*) marks the root or upper part of the antrum Highmorianum opened, that part which forms the floor for the eye; the alveolar process and teeth of the upper jaw are cut away, and of course the lower spongy bone is gone, and only the superior one (*l*) left. In this drawing, then, the length of the polypi, their slender stalks and bulbous heads, their peculiar direction, viz. hanging forward in the nostril, the straightened condition of the neck of the tumour, and especially the number of long stringy polypi occupying both nostrils, are circumstances, I doubt not, altogether new and unexpected. Now, you will judge, without any help of mine, how unlikely it is that picking the nose should ever cause this disease. The most impatient finger (I have said) can never (in picking the nose) reach that point whence these tumours have their origin, nor the most dextrous operator push his finger so deep as to reach these roots. You will also judge how impossible it is that operations should be successfully performed only on that bulbous part of the polypus which can be touched with the point of the finger; how difficult to apply a noose to the root of the tumour which lies so far beyond the narrow slit of the internal nostril. Remember, that in all your operations, and especially in the application of caustic to the roots of polypi extirpated by other means, your aim must be to reach a point nearly under the socket of the eye, in the deepest and highest part of the arch of the nostrils, where



the nostril opens backward into the throat. Remember the length of a polypus, (a circumstance which shall be demonstrated by other drawings) and that however low the bulbous part may descend, or be felt by the finger, it is only by pushing your instruments deep, beyond the narrow cleft formed by the projection of the spongy bone, that you can do good.

## PLAN NO. 2.



Let me next represent to you, in explaining the plan No. 2. what I conceive to be the chief difficulty in applying the noose to such tumours: the tube Fig. (1), was invented by Mr. Levret, for the purpose of passing a silver wire as a noose, and of tightening the noose after being thus applied; and in the application of the ligature, which was new, and peculiar to Levret, he had no motive so much at heart as the guarding against hæmorrhagy. This was a vain fear, for though I have seen dreadful hæmorrhagies in the last stage of polypus, I have never, in twitching away polypi with the forceps, seen a hæmorrhagy worth regarding; I have always kept a ligature in the nostrils, and a plug in the mouth, ready to be drawn up, by the help of

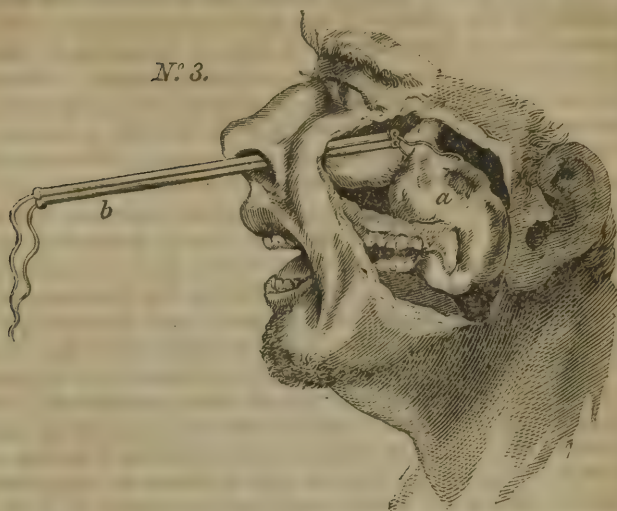


that ligature, into the posterior opening of the nostrils, but have not found occasion actually to draw up the plug more than three or four times in my life; and then rather from fear than danger. The tube of Levret is thus used, the loop of the wire (*b*) is passed over the lower end or bulbous head of the polypus, and hitched higher, towards the root of the tumour, by pushing the tube deeper and higher into the nostrils, or others (I know not who, for such probes are drawn in every book) advise us, after laying a noose of wire or cat-gut loosely about the tumour, to hitch it up to the root, where the tumour rises from the bone, by pushing it higher, first on one side, then on the other, by the help of the forked probe, Fig. 2. But when you look to the scheme or imaginary plan of such an operation, figure 3, you will foresee much difficulty in accomplishing it; for the tumour, long and slender as it always is, hangs in the direction in which you are to push the ligature; the ligature or noose, you never entertain a doubt, is to run as clean and easily along the polypus as a ring slips upon the finger, or as the ring of a window-curtain slides along the cord! but the truth is, that either from the polypus being forced backwards into the nostril along the ligature, or by the hitching of some part of the noose against the inequalities of the polypus, or by the narrowness of the nasal cleft catching the wire, it certainly is not merely difficult to apply it, but impossible. I have seen such an operation attempted fifty times, by men of various degrees of skill, and ingenuity, some extremely awkward, some perfectly dextrous, but never have I seen this method succeed: if even the ligature hung two days by the polypus, still the extirpation was but partial; usually the ligature gets no hold on long and slender polypi, which hang thus forwards in the nostril. Nothing, gentlemen, could tempt me, in a question where I am to deliver, not an opinion, but a plain fact, to prevaricate or disguise the truth, however unfavourable to myself; I have no curious nor cunning operation to substitute in place of that which I condemn; but I solemnly and impartially declare, that with my best and most sincere endeavour to succeed, I have always miscarried in attempting to catch a *nasal* polypus in a noose of wire or cat-gut; I have planned my little operations so cunningly, that I have imagined it impossible I should fail, yet, in my best concerted schemes I have been foiled as completely as the most awkward person I ever saw attempt the operation. I shall ever therefore retain a suspicion, that the method itself, rather than any want of address on my part, is to blame.

If I am correct in ascribing this difficulty to the direction in which the nasal polypus hangs, being the same with that in

which the ligature must be drawn, my reasoning will be confirmed, by the converse of the proposition being true, viz. that guttural polypi, those which, in place of occupying the nostrils, pass backwards into the throat, are easily noosed. This is an operation to the happy success of which I can speak with confidence as perfect, as my conviction is, that the operation just described never can succeed, or very rarely. When the polypus is single, or when one polypus has arrived at such a size, as to render whatever others may be behind it trivial; when the tumour, after having long filled the nostril, projects from the posterior opening of the nostril into the fauces, depresses the palate, hinders the swallowing as well as the breathing, and is both seen, upon depressing the tongue, and felt upon passing the fingers deep into the throat, firm, hard, and bulky: at this stage of its growth, when the surgeon most fears to grapple with such a tumour, it is in truth the most manageable! it may be extracted with safety; its root may be cut across by passing a curved knife along the nostril, yet not without difficulty; and if there be an internal tumour which admits of extirpation by ligature, this is it. It is the only case in which I can with perfect confidence promise to apply the noose, and where the tumour is thus visible in the fauces, the ligature must be passed through the corresponding nostril, hooked out from the fauces with a hook, or caught with the forceps, brought through the mouth beyond the teeth and lips, spread out upon the fingers, and by the help of the fingers (pushed deep into the throat) passed over the bulbous part of the tumour, and then the wire being pulled back through the nostril, it slides up to the root of the polypus, or near it, or may be placed pretty correctly by a little help. Now when thus drawn, the course of the ligature is transverse to the direction of the tumour, and is perfectly effectual in its operation; for the good effects of a ligature, thus applied, I would willingly be responsible, having so very often performed it with unvaried success. The plan No. 3. represents such a guttural polypus (a), small in its neck, very bulbous in its extremity, bulky and solid, so as to depress the palate, and so wedged in the upper part of the fauces, betwixt the fore-part of the vertebræ, and the bones of the face, as to cause almost total deafness, by pressing the mouths of the Eustachian tubes, and so exposed to the operation of ligature, that having passed it, you might, in place of gradually twisting and tightening the wire, by the help of the tube (b), twitch out the polypus by the roots, by mere force.

Experience, if ever you should be so unfortunate as to have experience in this disease, will best refute the prejudice so long indulged, so often mentioned as an apology for ill success, viz.

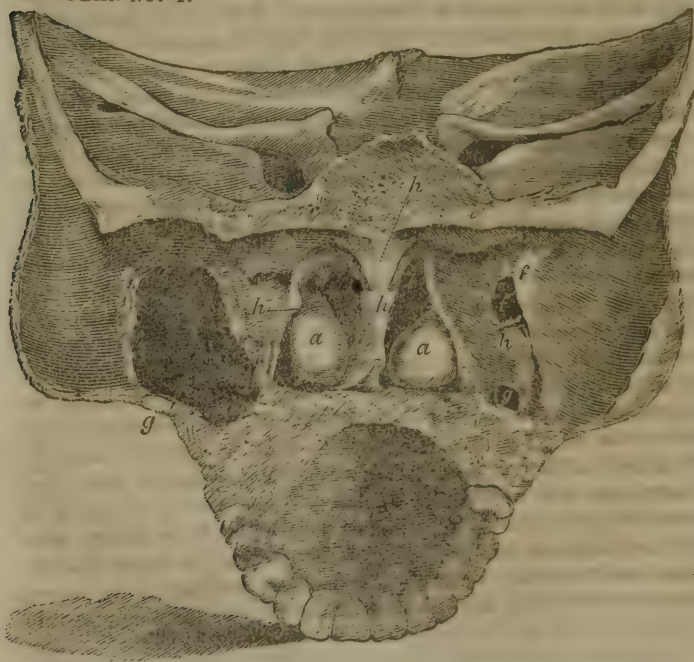


the malignant nature of some polypi ! If hæmorrhagies, pains, or a fetid ichor distilling from the nostril, are to be accounted tokens of malignity, every polypus must be malignant in its latter stage, for its first ill symptoms begin from the pressure of the tumour against all the cells and spongy bones, and especially the walls of the antrum Highmorianum ; and its fatal conclusion proceeds from a total caries of the face. In all the preparations from which these drawings are taken, the proximity of the tumour to the antrum Highmorianum, or great cavity in the upper jaw-bone, is observable. In the drawing of polypus, No. 2. where the incipient polypus is seen hanging flap-like over an edge of bone, that edge is distinguished to be the partition or thin plate of bone, which separates the antrum from the nostril. In the drawing of polypus, No. 4. where the small incipient polypi (a a) are seen one in each nostril, the post-rior openings of the nostrils (b b) are already almost filled with these tumours, small as they are. The great cavity of the antrum is marked on the left side (e) ; there it is cut entirely open. On the right side, though the bone is cut away, it happens by chance, that the very delicate membrane, or periosteum, which lines this cavity, is still almost entire, and you see into the antrum only by two small irregular breaches, (f g) in this delicate membrane. Thus explained, this little preparation seems to me of the highest importance to you, as giving you a clear and perfect conception of the original condition and final con-



sequences of tumours so situated ; where the most simple, destroying the bones by their pressure, must in the end seem malignant ; for the bony parts and cells, as they stand related to such tumours, may be reckoned thus : first the septum narium (h), or partition which divides the nostrils all the way from their openings before to that point where each communicates at (b b) with the back of the throat. Secondly, the sides of the nostrils (h h), which though seemingly very firm and solid in this drawing, because the jaws in this preparation are cut far back, are really very thin, especially in the middle of the nostrils, at that part where the lower spongy bone lies upon the side of the nose : this plate of bone, as you perceive, divides the cavity of the antrum Highmorianum (e f g) of each side from the cavity of the corresponding nostril ; it is in short the partition of the antrum, dividing that cavity from the nostril ; it is a plate of bone, actually as delicate as the os unguis ; covered with delicate membranes, and very easily destroyed by pressure ; and it is here that the caries, which proves fatal, begins. But it is further to be remarked, that the sella turcica lies immediately above the cleft of the nostrils, and the two anterior lobes of the

PLAN NO. 4.



brain lie in hollows by the sides of the sella turcica ; you have here then all the essential relations of these bony cells to the polypus, and must perceive, that as soon as the tumours (a a), fill the whole cavities (b b), distend them, and in the end press upon them, they will produce caries by such pressure, as speedily as an aneurismal tumour : that such caries will be long of affecting the septum, because it is massy, and yet can give way and be inclined to one side ; but will affect more immediately the thin partition betwixt the nostril and the antrum, and lay them into one cavity. The cribriform plate of the ethmoid bone, which lies immediately before the sella turcica, and above the nostrils, will be next affected ; and indeed one of the earliest signs of polypus is a degree of stupor from pressure on the brain ; and one of the most frequent and fatal conclusions of the disease is a continued coma, for several days preceding death. But more frequently the upper jaw-bone is destroyed ; the tumour makes its way into the antrum ; the whole upper jaw-bone becomes carious ; the teeth drop from their places ; and a fetid matter distils from their sockets ; and the patient dies, wasted by pain and hæmorrhagy.

Such is the condition of these long and pendulous polypi, which should, from their consequences, have been pronounced peculiarly malignant : in the tumours themselves there is no token of malignity ; in the state of the bones, there appears destruction enough to account for the fœtor, the pains, the profusion of matter, and all the worst symptoms of the disease, during life ; and for the miserable manner of the patient's death.

Polypus has sometimes, independent of any innate malignity, and rarely from its peculiar situation, a very peculiar aspect, and runs its course more rapidly. I am confident, I have observed that when polypus, which in its early stage, is usually attended with no worse signs than sneezing and running of the head, is attended with rheumatic and toothachy pains ; when the side of the face swells, before the natural growth of the tumour should produce this alarming change, and the cheek-bone particularly rises, and is covered with inflamed and puffy integuments ; when the incessant and acute pain is limited to one side of the face ; when the teeth loosen, drop out successively from their sockets, and are followed by a sanious and fetid discharge, we may be assured of the polypus having one kind of malignity, viz. that it is confined within a narrow cavity, that it is seated in the antrum, that the cheek and jaw bones will become early carious, while the destructive pressure is operating also in every other direction ; and that the polypus being within

the antrum, the operation of noosing is not practicable, and no ordinary operation, nor common degree of violence is likely to be successful in eradicating the disease. Thus far is early pain a sign of greater malignity, or, in other terms, of that destructive pressure, which in the end causes caries, hæmorrhagy, and death.

One thing more I beg leave to observe : it seems to me that the predisposition to disease is universal in the Schneiderian membrane ; that the earliest appearance of the disease is, in general, swelling, especially of that part of the membrane, which involves the spongy bones ; that almost universally the disease is produced by cold ; that many of those who have been under my care, having got wet in riding, running, or other exercise, have had a sudden and sensible cold, attended with violent paroxysms of sneezing, which has never for a moment ceased, till the polypus was perfectly formed, the breathing obstructed ; the particular character of the tumour, viz. that of moving backwards and forwards with the breath becomes perceptible, and the polypus, in short, tangible with the finger. Where the polypi are incipient only, they are flat and broad, have no pedicle, do not hang pendulous, but seem merely a general swelling of the membrane ; in some cases while the complete polypi in one nostril are long, slender, and pendulous, the incipient polypus in the other is flat, membranous, resembling one of the nymphæ in form, without a pedicle, and to all appearance a general swelling of the membrane : but I hold it unquestionable, that such an enlargement would in no long time become a conical polypus, for it seems to me that the neck or pedicle is formed by time, and the pendulous posture of the tumour : but a conclusion far more important, not certain indeed but probable, and not unworthy of consideration, follows, viz. that since the disease often is formed instantly, and sensibly, after a violent and sudden rheum or cold, and as it consists at first in a mere relaxation of the membrane, there is a stage in which it is perhaps curable by astringent solution, and the use of caustic.

From the conceptions which now open upon you of the nature of this disease, you must naturally suppose, that in place of arranging polypi according to the imaginary characters of soft, and hard, mild, and malignant, I should rather define the several stages and periods of its growth, and describe the operations corresponding with each stage. It is not by books nor conversation, that you will ever be able to decide which mode of extirpating a polypus is to be preferred : you will learn only, that some have used ligature, some caustic, some forceps, some the cautery, some heated irons, some long needles, with which



they have bored and transfixed the polypus! That old surgeons have been in the practice of cleaving the palate most unrelentingly, to get at those polypi which hang in the throat; while others have most audaciously proposed, to cut open the nostrils and cheek-bones! Each praises his own method as invariably successful; and the imagination of the young surgeon being left, distracted among such a chaos of inventions, though he is at a loss to choose, never doubts, that with such a variety of means before him, and the privilege of trying one after another, he cannot entirely fail. Many an operation, good and bad, successful and unsuccessful, have I witnessed; and certain practical conclusions, which I neither sought nor imagined, have come to be established in my mind; but especially these: That the surgeon who attempts to noose a polypus of the nostril, invariably miscarries; yet this is the kind of polypus, which being easily seen and felt, is supposed to be most easily noosed. That the big and bulbous polypus, which descends by the back of the nostrils towards the throat, and depresses the soft palate, though usually shunned as too bulky to be grappled with, is truly the most favourable for this operation; this is indeed the only period of its growth, in which the polypus can be effectually noosed. That the polypus which has its root within the antrum maxillare, is characterised by early and permanent pain, the caries of the jaw-bone, and the dropping out of the teeth, and that it is not to be reached with the silver tubes of Levret, nor to be noosed, nor extracted by ordinary methods, is too obvious to require illustration: it is equally obvious, that the polypus which has already burst up the cells, and produced a general caries among the spongy bones, is past all surgery: That the extraction of the polypus in such disastrous circumstances, only hurries on the catastrophe, as I shall prove by sad memorials. After being long perplexed, as every one must be who takes his first ideas from books, concerning the preferable modes of practice, I learnt from experience, what I regard as a discovery more precious and useful than that of the most curious instruments, viz. that each stage of the disease requires an appropriate operation; so that each method, in its turn, becomes valuable; and that with judicious distinctions, and moderate skill, every polypus has its appropriate mode of cure, except in its last and fatal stage.

I am now to define the several stages in the growth of polypus, which require appropriate operations; but do not flatter yourselves, that, because all seems clear and simple in description, every thing will be so in practice: I am, indeed, an enthusiast, but not in this degree; for though I hope and mean to make the subject very simple, yet you are in your turn to

have your disappointments and uncertainties. You are neither to judge by your eye, feel with your fingers, nor act with your instruments so perfectly, nor so dextrously as you might expect.

1. In its early stage polypus has invariably that character which is usually denominated mild: it is small, moveable, pale, colourless, and has not as yet begun to affect the adjacent parts by the pressure; there is a watering of the eyes, sneezing, altered voice, and interrupted breathing, but as yet no pain, nor any fetid ichor distilling from the nose: from the smallness and pendulous direction of such polypus, to noose it is difficult; and from the numbers of smaller polypi which usually lurk one behind another, the perfect extirpation of all of them by applying the noose is nearly impossible. The happiest and most successful process is to extract the body or bulky part of such polypi with forceps, and to destroy their roots with caustic.

2. In its next stage, the polypus grows to a great bulk, not only fills the nostril, but is visible in the throat, the voice is entirely changed, for not a breath of air reaches the bony cells, nor passes through the nostrils: the hearing is greatly affected; if you introduce your fingers deep into the throat, you feel a tumour so bulky, as at once to depress the soft palate, and compress entirely the mouth of one or both Eustachian tubes: the face is swelled and unsightly, the nose inclined to one side, blood begins occasionally to flow, and the matter distilling from the nostrils and throat begins to be fetid; the pressure is now universal, and begins to affect the bones, and the disease borders on that stage which is, I fear, incurable.

This bulky and seemingly dangerous polypus, terrifies the young surgeon: he reads in elementary books only of trivial tumours appearing in the nostril, and is alarmed when he sees a polypus of this enormous size: he has read in books of cases, of polypi thus oppressing the patient and descending into the throat, but he recollects that the surgeons, in these desperate circumstances, committed every kind of devastation, they often cleft the palate to reach the tumour, and were willing even to perforate the trachea: yet this case, or this stage rather of the disease, is not desperate; it is indeed on the verge of that period in which the polypus is incurable, but from its very bulk it is easily and effectually noosed. I find not the slightest difficulty in this case; passing a silver wire through the nostril, bringing it out through the mouth, and with the points of the fingers (thrust deep into the throat) raising it over the bulbous and most dependent part of the tumour, I draw it back into the nostril, and, as it appears to me, quite to the neck of the tumour, for I have often succeeded thus, and never found reason to seek the roots of the polypus, or apply caustic.

3. In its third and last stage, when the passages of the nostrils and throat have been long obstructed, and the face much deformed; when the patient has long endured the rending headaches, and pains proceeding from the distention; when the surgeon can distinguish, by pressing with his fingers, that the cheek-bones are softened, and the nasal bones become moveable, and fœtor and hæmorrhagies intimate the caries within; when the integuments of the face are puffy, the skin reddened, or livid, over the root of the nose, and the teeth loosened; when the stupor from pressure on the brain, and the chilliness from want of nourishment and loss of blood are great and continual, the disease is declining into its last stage, which we can hardly palliate, and cannot cure. This is the stage of the disease reputed cancerous, and operations undertaken in these circumstances, and performed, as I have seen them with rudeness, inflame the brain, so that the patient presently sinks into absolute stupor, and dies.

For every practical purpose, the definition of these three stages is, as I judge, altogether sufficient.

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## DISCOURSE XXIV.

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### OF THE VARIOUS OPERATIONS PRACTICABLE IN THESE SEVERAL STAGES OF POLYPUS.

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*Of the first Stage; or, of small and incipient Polypi.*

#### SECTION I.

THE first stage of polypus I no longer characterize by symptoms, the enumeration of these, I hope, I am entitled to omit in future. I am now to speak of the extirpation, of the means of eradicating, not apparently, but effectually, that smaller polypus, which hangs forwards in the nose, and only obstructs the nostrils. Of the operation of ligatures I have spoken with little restraint, I know too well what is usually done, what can be done by Levret's tubes, to mention that method with respect.



On this subject I will use but one plain blunt expression, and take notice that I say no worse of the attempts of others than I do of my own, (for I have many times attempted this method) That the disappointment of those who confidently expect and promise to noose such small tumours, is so frequent and so ludicrous, that I should be loath to quote examples: many are the times I have seen the surgeon thrust his tubes and wires into the nostrils, and withdraw them avain, leaving the nose streaming with blood: the attempt is, on such occasions, repeated without delicacy or mercy, and if he but so fix his tube that it can hang without dropping away by its own weight, he willingly leaves it there, and trusts his reputation to this first appearance of success. But it drops away on the second day, the breathing, the voice, the hearing, are still affected as they were before; even were there but one polypus, (and you know by these drawings, and I assure you from experience, that there are usually many) a second would immediately descend, and occupy the place of the first. But where a ligature is thus slightly applied, the point only, the mere bulb alone, of the polypus, is cut off; the nostril is so far closed, that the breathing is for a moment more free, but the long neck and root, from which the disease germinates again, remain untouched, and the individual tumour, which is the subject of the operation, sprouts again with renovated vigour in a few days. This then is a harmless, but it is as certainly an useless operation; I knew not how very trifling it was, till I had often failed: be assured that, however much you may be captivated with these ingenious tubes of Levret, for applying ligatures, and though you may be still more captivated with your own inventions, (for every one invents instruments for extracting polypi) be assured that a grievous disappointment awaits you, which I now warn you of. As Richter observes, there are but two methods of extirpating polypus, viz. by ligature, or by forceps, and ever since the time of Levret, who, from a horror at hæmorrhagy, and the fear of tearing away the spongy bones, invented instruments for passing the ligature, surgeons have uniformly preferred the ligature to forceps.

I will not allow myself to protract my discourse by any but occasional hints of the irregular and inefficient practices of the early surgeons, nor defer what must be interesting to you, the simple account of what experience has taught me: I was early aware of the little advantage to be derived from the ligature in smaller polypi, and learnt to use the forceps, the knife, and the caustic with particular freedom. I fear I tell you no more than the truth, when I say that, in my mind, every operation for polypus, must be one way or other, rude and cruel, to be at all

successful; and that these nice and curious methods must be unavailing.

The forceps, knife, and caustic, are the means I have found most suitable to the smaller polypi; and, according to the conceptions I form of each particular tumour, according to the period of its growth, the symptoms and effects of its pressure, and, by searching with the probe, or fingers, I use those instruments variously, and pursue them according to the progress and effect of the operations. I begin with the forceps, and conclude with the caustic, and I find the extirpation of a polypus, and the killing of its roots, not an operation to be performed with such a show of dexterity as to captivate the pupils who assist or are present; I find it to be a work at once slow and difficult, and often, I fear, it is imperfectly accomplished.

It is assuredly neither the root, nor even the body of a polypus, that you are able to seize with the forceps; but the bulbous point only; for you will observe in all these drawings, that the neck of the polypus, and all that hangs in the passage, is slender and delicate, that it forms a bulb only where it hangs below the narrowed slit of the internal nostril, or behind the palate; that it is of this bulb only, that I can catch a slippery and insecure hold, so that you may sometimes, in consequence of the slenderness of the neck, and, by a sort of accident, twitch it off from its narrowest part, and close to the spongy bone. The pedicle sometimes gives way spontaneously, the tumour dropping into the fauces: and it will often, by a happy chance, break off from the root in extracting.\* In such operation no man need affect unusual address: if the bulb retires before the instruments when pushed into the nostril, he has then a better chance of catching the neck: the bleeding so much dreaded, and made an argument, almost the sole one, by Levret, for adopting his method by ligature, is indeed extremely slight: from much experience I can assure you, that such hæmorrhagy will never weaken the patient, nor require a plug, which yet should always be in readiness; but it is not so in extirpating the roots of the tumour with the knife, then the hæmorrhage is great. Both nostrils are usually diseased, and, on the first day, I extract whatever polypi present in either nostril; but, far from imagining that I have done all my duty to the patient, I proceed at the next visit, and indeed at every following visit, to

\* The forceps, as they are now formed, seldom catch a secure hold. Those commonly used, and best known by the name of Polypus Forceps, are entirely useless; are bigger than the finger, and give no hold. Their blades are too broad. Those which I prefer and use are small, long, delicate, and their strength is put upon the thickness, not upon the breadth of the blade; they enter easily, and catch well.

search for polypi, or their remains. Some polypi, I find, come out entire, as I judge by their form; others, manifestly short of their full dimensions, and mangled.\* The anterior nostril being cleared, I see down into the nasal slit, and feel deeper with my finger: often, upon looking into the nostril, I see, even at a late stage of my operations, the remains of a polypus, or feel it with the extremity of my finger, and still more frequently I am sensible of eradicating, by various methods, polypi which are too deep to be visible; for behind the narrow slit which the finger cannot pass, the nostril is enlarged, and in that wider part, usually the vomer is pressed to one side, there is left a hollow in which the polypi hang. It is only by continual examination, and the most earnest attention, and a careful calculation of points and distances, that such remains of polypi are discovered: first, by a rattling noise, when the breath is driven through the nostril, which, though tolerably free, is so only at times, and in particular postures: secondly, by feeling with the probe, or with a bigger instrument, when we perceive that the back passage is not clear, the point of the instrument (I often use the Sound) encountering a resistance when



\* No. 7, a polypus of full size, root and all. No. 8, 9, 10, 11, polypi shown at their natural dimensions, or extracted in fragments.



it should descend to the back of the nostril, so as to touch the velum; the resistance we are sensible is not solid, such as would proceed from the probe encountering one of the spongy bones, but soft and yielding, such as we are sensible we could overcome by dashing the instrument down into the throat: thirdly, when the patient, in consequence of our first operations, inhales his breath freely, but cannot breathe out with equal freedom, we are sure that a polypus, or the remains of one, is still hanging in the back part of the nostrils, nearer the palate; acting like a valve, it recedes when the patient draws in his breath, but, when he breathes out, it falls flat upon the back of the nostril and prevents the exit of the air. Now, although I am pleased when I see the stupor lessen, the breathing more free, and the hearing restored, I am conscious that all is not safe, and that there must be added other essential signs of the passage being free. It is in this stage that the patient is usually dismissed, and most inhumanly, with some trivial directions of introducing bougies, or drawing astringent solutions up the nostril, to return in a few months with an incurable and carious disease of all the bones. When I find that, though the patient breathes easily, the head reclining backwards, he cannot breathe in the natural and perpendicular posture; when I find that though he inhales the breath easily, he finds it suddenly and vehemently stopped, however strongly and perseveringly he presses it; when I find (suspecting from those signs something wrong) that though the anterior nostril is free, some coloured body appears within the nasal slit, is felt with the finger, though indistinctly, and is directly encountered by the Sound, or big probe, passed from the nostril towards the throat; when I find that his breathing (even after having become free) after he is able to dash out by vehement efforts, the prodigious quantity of thickened mucus, which the inflamed state of the nostril generates, is yet accompanied with a rattling and snorting noise; when that peculiar noise continues after the nostril is cleansed by snorting, and by wiping it within with the probe covered with lint, I am sure there are some dangerous remains of the disease. Often I see this, after I have begun to apply the caustic, and discover the remains of the polypus, rounded by ulceration, of a brilliant colour and bud-like; but never, after this stage, do I expect good from the forceps: I proceed to rougher and more decisive methods.

When I find the whole of the posterior nostril closed by a spongy polypus, which I either have not reached, or have extirpated imperfectly, I have recourse to the knife: when I first ordered knives to be forged for me of the form represented in No. 6. I little imagined I had the least authority for proceed-

ing in this enterprising way; yet I find that, far from having neglected those passages of ancient authors, where the use of the knife, and the spathula, which was a sort of knife, was mentioned by Celsus, and by the Arabians, I had made accurate notes of their methods, which I had yet so entirely forgotten, as to proceed in cutting out polypi, with all the timidity of one who was attempting a thing, at once unprecedented and dangerous. I recollected no precedents, and reasoned only on the necessity, on the simplicity of the operation, and by analogy inferred, that if we might extirpate a tumour of the cheek, or lip, of the palate, or tonsil, with the knife, much more should we adventure to extirpate that of the nostril, since, by drawing up plugs into the nostril from behind, we could entirely suppress whatever hæmorrhagy any operation produced; we could apprehend nothing from the wounding of the spongy bones, and the operation of incision, in place of the rude method of tearing and mangling with forceps, seemed more delicate in relation to the membrane, and more effectual in respect to the tumour. I have never since that period (now many years past) spared the knife in operations of this nature: often I have used it in the first operations, and in place of pulling away the more bulky polypi with the forceps, have slipped in the knife into the nostril, and carrying it flat and vertical, till I reached, according to my apprehension, the root of the tumour, have then turned the edge towards it, and with some mangling, and not without both difficulty and fear, have cut it off. But when the nostril is already in some degree clear, when the anterior nostril is free in so far as to admit the knives easily, but the posterior nostril still encumbered with tumours, or the remains of tumours, I find it particularly advantageous, to pass the knife deep through the nostril, till it lies in the posterior opening of the nostril over the palate; then turning the knife, and striking a stroke alternately to right and left, or cutting with premeditation in that direction, in which from the probe, or the circumstances of the breathing, I suspect the tumour to hang, I free the nostril of this last obstruction. I do not know a greater happiness for the patient, or a greater victory on the part of the surgeon, than that of clearing the nostrils of this very dangerous disease: in whichever relation I stood, of patient or of surgeon, I would set no limits to the sacrifices I would make for such a purpose: I have ever remarked, that the period of suffering on the part of the patient, or of necessary cruelty on the part of the surgeon, though seemingly long, is really transient, and, when the end is accomplished, on the return of health and pleasure, when freedom of breathing, and of hearing is restored, is entirely forgotten. Therefore, I intreat you in

all such cases to persevere : there is but one immediate danger, viz. that of hæmorrhagy ; and I leave you to judge, whether any incision these knives can make, although it were directly into the membrane and among the spongy bones, much less such as is made into the slender neck or body of a tumour so small as to be contained within the nostril, could be dangerous ! Confident that it could not, I have always used the knife freely, and, though I have had the plugs for suppressing hæmorrhagy ready, and have usually indeed had the ligature ready passed from the nostril to the throat, prepared to draw up the plug, I have not more than twice or three times at the utmost had occasion to draw it, and then only to save the strength, and lessen the alarm of the patient, not to save his life.

Let me now represent to you, after these general descriptions, the particular acts of these successive operations.

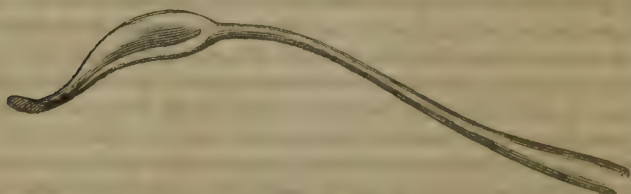
1st, For the extraction, you must be conscious, that with the best imagined forceps, you can grasp only the bulb or most pendulous point of the polypus ; that if you are successful in twitching out the polypus by its root, it must be by your good fortune in having to deal with a polypus whose root is naturally delicate ; that your forceps are to be used with any degree of success, they must be so formed as to operate with their blades vertical, viz. one towards the forehead, the other towards the chin of the patient ; or, in other words, according to the length of the nasal slit.

2d, Whether to amputate entire polypi, or to eradicate those which have been partly extracted, you will do better to use a knife sharp on its convex edge. Those fashioned like the one in plan No. 6, which I have hitherto used, will be found occasionally very convenient, especially in cutting at the roots of polypi lying far back in the nostril, or in the arches of the palate, and where you are to make your cut by hooking the crooked knife beyond the root of the tumour, and drawing it towards you. But I am conscious that I could manage the form, No. 5, with perfect safety, and it is manifest that I could cut more decidedly with it ; for the polypi hang down from the upper spongy bones, in the form I have represented in all the drawings, and especially in the drawings, No. 1 and 3, but which I have more correctly represented in the plan No. 6, which I drew in the time of operating, and for the correctness of which I can be responsible. After long reflection and many partial operations on this patient, I sketched this plan the moment after my finger and instruments were out of the nostrils. As soon as the gentleman, being freed from pain, could sit composedly and without suffering, he seated himself before me, while I made the plan, with every recollection and feeling fresh and lively.

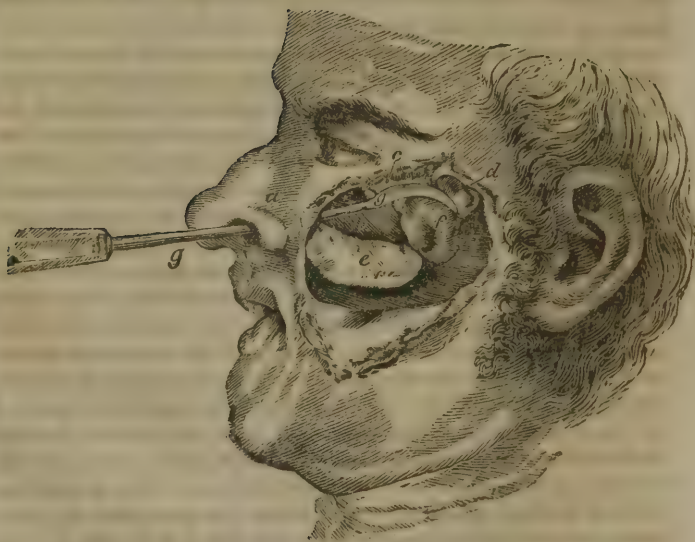


In this plan are represented the features in profile; the cavity or hollow formed by the bending aside of the vomer or partition of the nose; the roots of one polypus already extirpated, the remaining root being still sufficiently long to appear moveable upon looking into the nostril, and exposed, of course, to the stroke of the knife, and requiring it; another polypus entire, and deeper seated, obstructed the back of the nostril, allowing the patient to draw his breath, but falling down valve-like, so

PLAN NO. 5.



PLAN NO. 6.



as to prevent the breath being driven out: (*a*) a semicircular dotted line marks the place where the cartilaginous wing of the nose terminates, and the opening of the nostril is narrowed by

the arch of the nasal bone: (*bb*) the hollow produced by the receding of the vomer towards the left, being pressed by the bulk of the polypus: (*c*) marks the upper spongy bone, where the polypi had their roots: (*d*) the remains of a large polypus, which had originally filled the whole opening of the nostril, and of which only the root (*d*) is left, but was left of such a length as to require a stroke of the knife: (*e*) the direction of the lower spongy bone represented in a dotted line. This lower spongy bone, hanging on the edge of the antrum under the cheek-bones, and the antrum being cut away, it can be represented only by this imaginary line. (*f*) marks a longer and more entire polypus, which so obstructed the back opening of the nostril, (viz. that towards the throat,) that neither the big-headed probe, nor even the common probe or director could pass freely: (*g*) demonstrates the direction of the knife, when passed down the nostril, towards the throat, so as to cut the polypus, in withdrawing it, by very slightly turning its edge. But it is obvious, that had I used knives cutting on the back, though I could not have been sure to conduct them so harmlessly through the nostril, I should have been sure of using them more effectually; for a knife so formed, scythe-like, and cutting on its convex edge, could not have failed to cut off, and that probably very near its root, whatever polypus hung down from the upper spongy bone.

3d. For the suppressing of the hæmorrhagy, it is necessary that you be made acquainted with the introduction of the noose, which is a method at once simple and effectual, of drawing up a plug from behind the palate to the posterior opening of the nostril, so as to have it in your power to close at once both openings, to restrain the blood. You are to take, not a piece of catgut, for that is liable to twist very provokingly, and to be so softened with the moisture of the fauces as to lose its shape; but a piece of delicate silver wire, or, occasionally, I have used a harpsichord wire, and doubling it, you make the patient gape, introduce the loop of the wire through the nostril, and watch its appearance in the throat; the splendor of the silver wire shows it at once; if you find the patient not at all excited to cough, you may be assured the wire has not yet reached the fauces; if he is in danger of suffocating, you may be assured that the loop of the wire actually touches the epiglottis; then you will retract it a little, and the irritation will cease. The way to succeed is to carry all quietly and softly, to insinuate the wire along the nostril very gently, to watch for it in the throat carefully, to mark its appearance instantly, when it begins to pass behind the velum, to push it no farther, for then it touches the irritable parts, to be ready with the crooked probe, or the dress-

ing forceps, or a blunt hook, to catch it the instant it appears, and draw it out by the mouth. Then, in the loop of the wire, you fix, with a piece of thread, a small pad of charpie, and make ready to draw it back through the mouth, and up behind the soft palate, into the back of the nostrils. You prepare for this act by twining the wire round the fingers of your left hand, near the nostril, and by holding the plug upon the point of the fingers of your right hand; you then draw back the wire through the nostrils, and push the plug into the mouth by corresponding motions of your two hands, and when you have got the plug to the back of the palate, and just sticking in the fauces, you must not leave it a moment there, but by a sudden jerk with the left hand, pushing boldly at the same moment with the fingers of the right, you bolt it up into the posterior opening of the nostrils, above the back of the palate, and fix it at once in the cleft at the back of the nostrils. This being finished by plugging, at the same time, the opening of the corresponding nostril, there is no longer a possibility of the blood escaping. I have several times needed to use this method in cases of epistaxis, and three or four times after extirpating polypus, but especially after using the knife.

4th. When all is done that knife or forceps can do, I proceed to use the caustic, and with this conviction, that I should be very indifferent indeed, whether I destroy the polypus only, or the spongy bone, or much of the membrane, if but the polypus be destroyed. However confident I am of having extirpated the tumours by my preliminary operations, I never think it superfluous to burn the roots, but apply the caustic the more boldly, when, by the frequency of my operations, I am sure of being able to mark the points of the nostril at which I have to expect the roots of the polypi. To apply the caustic effectually, you must apply it boldly; and if you consider the important object to be attained, you will be careless although it should affect the spongy bones; or rather, you will be fearless of every thing, but the error of not applying it effectually. I find much address necessary in this, which I confess I have learnt slowly.

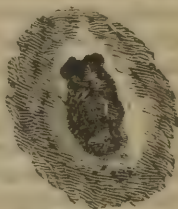
I alter my method occasionally, in the course of a cure, and according to the circumstances of each case. First, I am careful to have the nostril entirely cleared of mucus, which, in the inflamed state of the fauces, and especially after the operation of the caustic is begun, is secreted in such profusion as almost to suffocate the patient: he draws much back into the throat, he drives much outward by blowing the nose, and I clear out the nostril effectually with the probe rolled in lint, and then the nostril, raw and red with the violence it has sustained, is so clearly seen that I have often perceived, upon looking into it, a bud or



germ of the polypus still remaining, though very deep in the nostril, and very small. But independent of this process of clearing and inspecting the nostril, we are able, merely from calculating the depth and distance of the upper spongy bones, and recollecting the circumstances of the operation, to apply the caustic to the roots of the tumour with much confidence; no dismal consequences have I ever witnessed, nor even the slightest inconveniencies from its being misapplied.

I never have used a pencil of caustic\* in a port-crayon; that, I know, would be, extremely dangerous, but spread the caustic upon lint; (I at first spread it upon leather) as I would for making a common caustic issue. First, I fold a piece of lint twice or thrice, and give it a triangular form, (fig. 13) and after pounding the caustic, I mix it with water into a paste, and spread it in the form and dimensions (a)

Fig. 13.



upon the lint, and then bend the lint over the point of a probe, or of a directory rather, the big obtuse point of which carries it, and deposits upon the precise point you wish, fairly and without getting entangled in it. In passing so big a caustic along the nostril, the parts would be cruelly excoriated, were we not careful to guard the canal, which I do, by cutting a stripe of sheep's leather, and conveying it high into the nostril with the probe, and laying it flat and smooth along the surface to be cauterised. I leave it there, and turning the caustic towards it, I run it up to the point I design to burn. Upon the slightest sense of disappointment I withdraw both, and begin anew; but being conscious that I have succeeded, I withdraw the sheath of leather at the same moment that I push up the caustic to the part, and I impress the caustic very firmly upon the part; for, the instant it touches the naked surface, the eyes fill with tears, the patient draws a long breath, and sneezes tremendously, and instantly displaces

\* I find, in looking over my notes of cases, that this is not quite correct; that when I first began to use the caustic, I used it by soaking a large piece of camel's hair pencil in it, conveying the brush along a canula made of a playing-card; but finding such application quite ineffectual, and having also thought of using a port-crayon, perhaps I may have tried it, but I even, in this first case, renewed the use of it, and betook myself to the scraped caustic, which being laid thick, is equivalent to a solid caustic, and yet absolutely safe.

it: but if you press firmly, this irritation goes off; if you have passed it far beyond the strait of the nostril, and up to that point where always I conceive the roots of the tumour to lie, it seldom is driven away by any future paroxysm of sneezing. It does sometimes happen, that the profuse secretion of mucus carries it down, and the operation being performed at ten o'clock, for example, the caustic is discharged by two or three o'clock; but often I have found the caustic in both nostrils next day at dressing. It will add to your assurance and confidence when I tell you, that deep as you may appear to yourself to have introduced the caustic rather beyond the nostril as you would imagine, and on the very verge of its posterior opening, just over the palate, it never falls backwards into the throat, nor ever is swallowed; of the many hundred times I have used the caustic, no such thing has ever happened.\*

There is one thing perhaps contributes to its coming always forward, viz. that the moment the caustic is placed, and the sneezing is over, I instantly cram the nostril full of little dossils of lint, which are lying ready prepared, and are quickly handed to me; if this be not done first, the nostril and upper lip are severely excoriated and deeply corroded with the caustic; secondly, the caustic piece of charpie, if not supported by others from behind, is apt to be displaced; the nostril being enlarged by the polypus, requires a great deal of lint to fill it; and to prevent any drop of melted caustic or mucus descending this way, I ram the lint hard into the nostril at each dressing. I find the lower dossils of lint discharged, (those I mean, which fill the cartilaginous mouth of the nostril) the caustic ones often are returned (they occupying the deeper, straiter, and bony part of the nostril, beyond the narrow slit formed by the nasal and spongy bones.) The dossils and mucus are hooked out, the mucus picked away, and sometimes the nostril washed with barley-water or oxymel at each dressing. The caustic I apply every second or third day; I often continue this severe process, during a whole month, with occasional intermissions; and I confess the whole cure to be so difficult, that whether from the presenting of polypi already existing, or from the quick regeneration of those already extirpated, I have had occasion, even while using the caustic, to repeat my incisions with the knife; and while I am making incisions upon the remains of

\* It was long before I was entirely void of anxiety on this subject; I find in my notes, a case of a young lady of 19 years of age, who is now in perfect health, that in place of using simply this plodget of charpie, coated with caustic, I mounted the lint upon a cone of stiff paper, or card. the conical form of it, the apex looking forwards would, I expected, prevent the caustic from passing backwards into the fauces. I did not then know how superfluous such precaution was.

the polypi, or consuming their roots with caustic, I find it advantageous to clear the nostril, especially in its back parts, by methods almost approaching to rudeness, by wrapping a big iron probe, of a curved form, round with lint, or mounting it with a sponge, and running it thus guarded down the nostril: I make it so large as not only to fill the nostril, but to pass through it with great difficulty, and by forcing it through the slit of the nostrils, quite back to the palate, I often force off these remains of polypi, which are already half consumed, or imperfectly cut.\* These, gentlemen, are the methods which, used with perseverance and courage, have seldom failed me: of many patients whom I have treated, there are very few, I declare solemnly, who have returned to put themselves under my care: of the entire recovery of such as I have not seen again, it would be presumption to speak confidently, but from many I have had the happiest assurances of their continuing in perfect health. Such is my process with the softer, smaller, and incipient polypi, which occupy only the nostrils, and are pronounced mild and benign:† the hard and bulky polypi, passing down into the throat, require other operations; and to explain these, demands a more methodical enumeration of the various inventions, and, I may say, cruelties, of the older surgeons.

## SECTION II.

### *Second Stage of Polypus.*

The fears of the surgeon increase in proportion to the size of the polypus, and there is no task from which he revolts so much as that of grappling with a polypus which already depresses the palate, and begins to fill the fauces and throat.

\* I see occasionally the half-consumed polypus, or rather the root of it, of a very florid red colour, and touching it with the probe, I feel it hard and granulated: sometimes the opening of the nostril is so exulcerated as to require intermission of the process, and the anointing of the excoriated parts with oil or ointments.

† I should be sorry to omit mentioning an operation, which has been approved and commended by the greatest practitioners, and has held its place from the earliest times; it was invented, I believe, by the Arabians; is described by Albucasis, and was used successfully by La Faye, in the Hotel Dieu. It is the passing a large seton or cord from the mouth through the nostrils, knotted, at intervals of an inch or more; the knots are meant to press upon the roots of the polypus, and made larger, and drawn up tighter, in proportion as the tumour yields, or the passage dilates. The mechanism of this invention is easily understood by those general terms, and I am not entitled to be particular, as no occasion has presented itself, in which I thought of using this method; but it is surely worthy of being mentioned, and I can imagine a variety of circumstances in which it may be useful.



Such a tumour left to itself, is indeed full of danger; the nostrils and throat are filled with its bulk, the bones sorely compressed, as the pain and stupor sufficiently evince; the voice affected; the hearing injured; the breathing and swallowing interrupted; the patient is thence in the utmost jeopardy, and that stage fast approaching which is so incurable. But this bulk, which threatens destruction to the bones, facilitates all the surgeon's operations, and is a probable sign of the tumour being single.

Surgery was at one period rude and cruel in all its operations, but those used for the extirpation of polypus, were so in a peculiar degree. The larger polypi, depressing the palate and extending towards the throat, seemed to the ancient surgeons to vindicate every degree of violence. They attempted the extirpation, sometimes by the most cruel cauteries, oftener by main force. They, if the polypus was long and pendulous, tugged at it with merciless rudeness; if beyond their grasp, they consumed it with heated irons.\*

But of all the examples of successful violence upon record, none is so well calculated to shew what the parts will suffer, to banish all fears of endangering the brain by violence done to the spongy bones, while extracting polypi with forceps, as that which I am now to lay before you. It will at once suggest many practical reflections, and teach you much of what you ought to know familiarly, concerning the relation of the tumour to the passages of the nose and throat.

Mr. Manné, a respectable surgeon of Avignon, was the operator, and he related the case in a small volume, published at Avignon, anno 1747: not contented with the ordinary means of extracting the polypus, finding even the strongest crow-bill forceps unavailing, he transfixed a large and cartilaginous tumour with many ligatures, each of which successively he twisted round the body of it, and with the help of these, used like a halter, and by pulling upon the projecting part of the tumour, and pushing at the same time that part of it which he could reach by introducing the fingers into the throat, he delivered the patient of an enormous massy polypus, which, in bolting through the nostril, made a noise like that of uncorking a bottle. The patient, from confusion, pain, and loss of blood, fainted; while the numerous assistants were left in a degree of

\* This method of destroying polypi by cauteries, little used by modern surgeons, was universally employed in those times when fire superseded blisters, letons, issues, incisions! and nothing but fire was used for headaches, white swellings, hæmorrhagies, rheumatisms, tumours! Whatever, in short, was to be done, which could not be done by incision, was (to use the words of Hippocrates) "to be done by fire."

astonishment, from which they did not soon recover: but these, with many other points, you will best learn from the narrative of Mr. Manné, which is very perspicuous.

“ Etienne Ducrès, a villager of the Duke de Gadagne, seventeen years of age, born in the village of Saint Saturnine, in the Comptat, was attacked, in the year 1745, with a violent hæmorrhagy of the nose and throat, occasioned by extreme heat, from the direct rays of the sun striking upon his head during the labours of the harvest. During months the hæmorrhagy returned from time to time. The rheum, and stoppage of the passage, which followed this, shewed the thickening of the membranes and glands, and soon after the patient began to snivel through the nose: the passage was daily more and more obstructed; he was no longer able to breathe through the left nostril, which proved the existence of a tumour.

“ He now betook himself to Avignon, and there consulted a surgeon, who, though he found an incipient polypus in the nostril, found nothing, at that time, wrong in the throat: he pronounced the heats of the autumnal season, to be very unfavourable to any operation. This unhappy delay gave occasion to such a growth of the polypus, that in the space of a few months, it had not only filled the cavity of the nose, but protruded backwards into the throat, and forwards through the nostril.

“ The patient, alarmed by this sudden growth, had once more recourse to his surgeon, who now attempted the operation; and holding the mouth open with a speculum oris, he tried to twist and tear away the polypus from the throat, with crow-bill forceps, and pincers of various forms; but succeeded so ill as to tear away only one morsel, the size of a peach-stone.

“ Wearied with this fruitless labour, he was willing to try, whether he could not obtain a better hold on the polypus hanging out of the nostril; but at the first pressure of his forceps, there came on a hæmorrhagy so alarming, both to the surgeon, and to all who assisted at the operation, that their work was instantly suspended: yet they made four more attempts of the same kind, within the eight succeeding days, and at each time were alarmed with the same hæmorrhagy, and obliged to desist. From the time in which these fruitless operations were altogether abandoned, the patient suffered periodical hæmorrhagies; sometimes from the throat, (issuing from the lacerated end of the polypus) sometimes from the nose, (where also it had been torn and mangled with the forceps) and often he bled from both nose and throat, the polypus growing incessantly, so as to burst up the bones of the nose.

“ After the attempts just mentioned, there came a violent inflammation and abscess of one side of the face: the skin sup-

purated; the cartilage of the wing of the nose was ulcerated and opened; the suppuration, and all its consequences, increased daily for two months, and at last ceased; and then the patient fell again into his old disorder of periodical hæmorrhagies, the blood issuing chiefly from the nostril, by the side of the polypus, and through a fistulous opening on the cheek near the nose.

“ In this desperate and most deplorable situation, the patient addressed himself once more to his surgeon, requesting his help. But this gentleman, unwilling to risk his reputation further in so hopeless a case, contented himself with prescribing some cathartic powders. The patient knew well that this was but an apology for leaving him to his fate, was anxious to find some one resolute enough to do him good, and lighted happily on Mr. Manné.

“ When this patient came to me, (says Mr. Manné) I conversed with him, consoled him, supported his hopes, and his courage; and after some restoratives, and general remedies, undertook the operation in my own house, on the 25th of October, 1747, two years after the commencement of the disease, in presence of fifty gentlemen of the profession. I did not choose to have so particular a case reported only on my own testimony, or on that of a few partial friends.

“ In the presence then of this respectable company, I began my operations, without having recourse to the gag, or the speculum oris, used in the former operations: I placed the patient opposite to a window; and reclining his head a little backwards, I intreated him to open his mouth wide, which he did very courageously; I then took a crooked bistoury, passed it betwixt the velum pendulum and the tumour, and slit up the velum from the side of the uvula to the palate bones, and proceeded then to the tumour itself, which was wedged in the throat. It was so firm, that it resisted the knife, as the attendants will testify, who cannot but remember the quantities of blood that flowed after each incision. The moment I began an incision, the flood of blood suffocating the patient forced me to desist; when it ceased I renewed my attempt, only to be interrupted by a new hæmorrhagy: till at last, at each incision, in consequence of the hæmorrhagy that ensued, the patient fainted, so that we were obliged to allow long intervals after each stroke of the bistoury, lest the patient should actually expire.

“ The assistants were careful during all this time to support the patient with spirituous liquor, and occasionally spoonfuls of nourishing soups; and thus from incision to incision, from hæmorrhagy to hæmorrhagy, after many paroxysms of faintings, did I, at last, partly by the knife, partly by tearing, se-



parate completely this mass of tumour, which lay in the throat, and which I immediately delivered to the bye-standers, that they might examine its extreme firmness and semi-cartilaginous nature. The patient, restored as it were from death to life, had still sufficient strength to walk from my house to the suburbs, where he lodged, when he was presently put to bed, and a proper diet and regimen prescribed.

“ It was not fit that we should comply with the spirited and resolute request of this young man, who besought us to finish our operations, and deliver him at once, of whatever remained of the tumour. I thought it prudent to allow at least a few days of rest and nourishment, to repair this loss of blood.

“ After three days the slight fever excited by the operation having subsided, and his strength seemingly recruited, I resolved to begin my operations anew. This was in October, 1747: I placed the patient with his back resting firm, and his head reclined and fixed: I knew too well the firm and cartilaginous nature of this tumour, to think of extracting it with forceps, which would but tear it into morsels, leaving perhaps, after the laceration of the nasal portion, and of that which hung backwards in the throat an intermediate part, which would still obstruct the nostrils, and occasion endless operations. I saw the nostril besides, too completely filled with this polypus, to admit my forceps, and the polypus itself too firm to be grasped in them: I had experience sufficient moreover of the partial and imperfect success of the forceps, in the case of Jaques Grenau; I therefore resolved upon a more decisive, and more direct method of unrooting the whole at one pull.

“ With this design, taking in my hand a needle remarkably curved, threaded with a strong waxed ligature, I transfixed the polypus as far back in the nostril as possible: I then cut the needle away from the ligature, and (the ligature being double) I took first the two lower ends, and tied them firm round the lower part of the tumour, and the two upper ends I tied in like manner round its upper part, and then taking one end of each, viz. of the upper and lower ligature, I twisted them on one side, I tied and twisted the two other ends on the opposite side, and thus having transfixed the centre of the polypus, and twisted these numerous ligatures round the sides of it, I had got a hold which could not slip: I grasped the four ligatures, twisted them into one, and pulling by this hold, I brought the polypus so low, that not merely the part thus transfixed with the crooked needle, but half an inch more of the polypus appeared without the nostril. I took now a second crooked needle, transfixed the polypus with a second double ligature, like the first, tied and knotted it in like manner, and having thus got a firmer

purchase, I twisted the four ends of this ligature along with the first, round the tumour; and now shaking the whole mass of the polypus from side to side, then moving it with a rotatory motion, then pulling from right to left, and next reversing that motion, by moving the mass from left to right; in short, by moving and shaking the polypus in every possible direction, I sought to disengage it from its connections, pulling towards me always with such strength, as to make the tumour follow every lateral motion, and yet with such a measured force, as to prevent the ligatures breaking; for had that unfortunately happened, the tumour itself would have receded into the nostril, while a fragment only would have remained in my hand.

“By successive and regulated efforts, I so far succeeded, as to elongate the tumour still more; an inch more of its length appeared without the nostril; I struck a third double ligature through the polypus, which I twisted as formerly, and added to the others; and with this new purchase, I pulled so successfully as to elongate the tumour still more; and transfixing it again with a fourth ligature, as deep as possible within the nostril, I obtained, by pulling with the whole sixteen ligatures, inconceivable power and purchase.

“I was now on the point of extracting the polypus by the roots; and by the happiest chance observed a trifling circumstance (for the most trivial circumstances are, in the critical moment of an operation, of the very last importance) which contributed greatly to my success: having introduced two of the fingers of my left hand crooked, into the throat, to feel whether the hold I had upon the nasal branch of the polypus affected that within the fauces, and whether the guttural part of the polypus was of such a form as to pass easily back again through the opening from the throat to the nostrils, so as to follow the nasal branch when it was extracted, I felt distinctly, that by pulling the ligature which surrounded the nasal branch of the polypus, I not only moved at each pull, the branch which hung down into the throat, but also was sensible that this lower branch (the branch which I had formerly cut with the bistoury) consisted of two tubercles or heads, greatly exceeding in size the posterior opening of the nostrils. With my fingers of the right hand, twisted among the ligatures surrounding the nasal branch, I pulled upon it; while with the fingers of my left hand, thrust into the throat, I pushed back towards the posterior opening of the nostril, the tubercle which was nearest to it; then by a second effort of the same kind, I forced the second tubercle to follow the first; and being sensible that both were fairly entered into the passage of the nostril, I continued to thrust with the fingers of the one hand against the guttural

part of the polypus, pulled with the other upon the nasal branch, and redoubling my efforts, and increasing the force, in proportion to the progress of the polypus, it, after much struggling, and many repeated endeavours, bolted (after one final effort) so suddenly out of the nostril, that the noise was like that of uncorking a bottle.

“ The moment the polypus was torn away, you would have thought the patient would have expired, the blood bursting out in a full flood from nose and mouth: but as the blood burst out thus suddenly, it ceased as instantaneously; for it proceeded chiefly from the vessels of the polypus distended by the compression, which were no sooner emptied than they ceased to bleed.

“ The spectators did not soon recover the amazement with which they were struck at seeing so enormous a mass of tumour issue from so narrow a passage. This polypus was covered with a membrane, very white, smooth and polished, with an infinity of small vessels circling upon its surface; and its surface was dotted with an infinite number of bloody points, red with drops of blood, denoting the manner in which it had adhered to the pituitary membrane.

“ No sooner was the lad delivered of the polypus, than he straightway breathed through that nostril freely, and was as suddenly relieved of an insupportable headach, with which he had been night and day tormented for more than a year. He recovered his sense of smelling; but what is more singular, he recovered at the same time the sense of tasting, which he had entirely lost. After this second operation we washed out the passages with detersive and vulnerary injections, to which spirituous tinctures were necessarily added, to correct the putridity of the foul and very fetid sanies, which, by its horrible fetor, declared the disorder of the parts produced by this tedious disease, and the recent violence done to them.

“ Yet the patient was in perfect health, weakness excepted: he was free from fever: he slept as if he would never awake; and when he rose it was with the appetite of a famished creature, ravenous for food. But the attendants were inexorable, and never permitted him to exceed the diet prescribed for him.

“ Two days, and no more, had passed, when the patient, all at once observed, that he had no longer that perfect freedom in swallowing and breathing, which the operation had restored him to so suddenly. He was sensible of a new obstruction in the throat, little differing from that which he had so long endured: I visited him on occasion of these new symptoms, and I will ingenuously confess, that if I was astonished at the size and nature of the first polypus, my surprise was inexpressible,



when I found the throat choaked anew, with a polypus of such enormous size, that it seemed as if not a particle of the first had been actually destroyed. I, without loss of time, convoked the physicians and surgeons who had witnessed the first operation. They were, I believe, not a little astonished to see, apparently, the individual polypus which they themselves had assisted to extract, re-occupying its proper place. Curiosity led us to examine how this could be, and no conjecture seemed more probable than that this new polypus had fallen down from the upper and back part of the nostrils, where it had been squeezed up by the former polypus, and nitched in the narrow cavity: the extirpation of the former, it would appear, had made way for this falling down.

“ I did not long hesitate how to act, but waited only the return of my patient’s strength, to cut off this polypus also: for I was afraid, in his present weakness, of the hæmorrhagies inseparable from such operations. I allowed however only six days to pass over, when convoking the same surgeons who had assisted me at the former operation, I, in their presence, on the third of November, cut out from the throat, a portion or knob of the new polypus, represented in the drawing, which I accomplished now with much less pain, because it hung by two pedicles, and was softer than the former: the hæmorrhagy was moderate, and nothing to be compared with that of the former operations.

“ The patient instantly felt the benefit even of this partial extirpation, for the throat was entirely freed, and he even began to breathe through the nose: but this quiet state he did not long enjoy, for before morning a new lobe of the polypus had descended, occupied the place of that just amputated, and all his difficulties and distresses returned with the tumour. Nothing remained for me, but to relieve the patient, by cutting off all the heads of this Hydra, or abandoning altogether an operation, in which I had already atchieved so much, which had cost myself such anxieties, and my patient so much pain and suffering. My spirit was so raised, and the patient himself so full of confidence and courage, so well resolved to submit himself to whatever I thought fit to do, that it was determined to cut this polypous mass once more, and to the quick. But I had found such advantages in allowing an interval betwixt each operation, that I imagined I could not, on the present exigency, act more prudently than to allow the patient a short respite.

“ But while I was meditating this new operation, the singular nature of the case drew together all those, who had hitherto in compliment to me, or through charity towards the patient, watched the course of his disease, and, by perpetually thrust-

ing in their fingers, touching the polypus, torturing the nostril, searching in various ways, some to ascertain its size, others to feel for its root, others with the hopes of reaching its pedicle, and disengaging the tumour, without having further recourse to the knife, the roots were finally so torn and lacerated, and the body of the tumour itself was so compressed and bruised, that in a few days it began to shrink and shrivel, fell into suppuration, became rotten and fetid, and dropt away piecemeal in small portions, one of which however was as long and as large as a thumb: by this wasting of the tumour the patient was freed of it in a few days, without the help of the knife or cautery, nor did I choose to meddle with the roots of the tumour, both because I thought that where nature had done so much, it was wrong to interfere; and because I could perceive that the root or basis of the tumour was melting away slowly of its own accord."

Mr. Manné has added in his book, in testimonial of these facts, the affidavit of nine of the Gentlemen who attended the operation, and of François Payen, in whose house the patient lived.

"This," says Mr. Manne, in concluding the narrative, "is a deadly blow to the opinion of those who believe in the plurality of polypi:"—by no means: it is as I have said, in the words of the fable, one looking on the side of the statute which is white, while another looks on that which is sable. Polypi of this magnitude are usually, but not necessarily, solitary.

A narrative so very interesting as this, should not be dismissed slightly; it suggests various useful remarks; it opens up to us much of the rude practice which prevailed even in the last century, of slitting up the palate, pulling with great iron forceps, bolting out the tumour at the same time, by pressing behind the palate with the fingers; extracting by main force of pulling, with the help not unfrequently of a great crooked knife. We are led by this narrative to doubt the prognostic handed down from the times of Fabricius, or indeed of Celsus, of the soft polypus being mild, the firm and hard cancerous! Every polypus is soft in its commencement, firm in its perfect growth: I never have grappled with a polypus of this size, or any thing approaching to it, which was not semi-cartilaginous of a stony hardness; such at least were those of a young man of the name of Reid, and of one Gow, which I extirpated with ligatures; their cases I shall presently mention, for other purposes than to prove this fact. But surely, if ever a long and firm polypus should by nature, and by irritating causes, have become cancerous, this might have been so; nay, I doubt not, that in examining the records of our profession, you will find those carti-

lagicinous polypi the most frequently and effectually cured ; and I shall presently state to you my reasons, why I would rather grapple with a big polypus, than a small one ; rather with a tumour that reached the throat, and depressed the soft plate, than with one which were but indistinctly felt in the nostril. The latter is small, delicate, and yields to the forceps ; the body is crusted so as to give no hold, while the neck and root remain untouched ; the latter, in proportion as it grows firmer in its body, grows smaller in its neck, or pedicle, its root cannot much enlarge, while its body does ; the disproportion betwixt the tumour and its pedicle is daily increasing, and becoming more favourable to all kinds of operation, whether rude or skilful. The polypus, by this process, has been known, I have known it myself, drop away in process of time, as ripe fruit drops from the tree.

The merit of the operator, in this singular case, is least of all to be passed in silence. The enterprise was bold, manfully conducted, and attended with success every way gratifying.—Never perhaps was there a more desperate situation than that of the patient ; the face deformed, the cheek in a state of supuration, the gristle of the nose perforated, the polypus protruding through the opening of the nostril, filling the cavity of the nose, and extending to the throat : the disease neglected for two years : the patient tortured with pain and confusion of head, dying of hæmorrhagy, and soliciting the surgeon to perform any desperate operation that might promise relief. The polypus of that firm and cartilaginous texture, which all writers have agreed denotes a cancerous disposition. Even such a tumour was torn, mangled, cut, one way or other extirpated, and finally cured ! From this what should we infer ? First, that if there seem something of good fortune in that perpetual laceration, with the fingers of inquisitive visitors, by which the patient was ultimately delivered by ulceration of the polypus, or its remains ; still it was that sort of good fortune which the bold and skilful deserve ; and next it leads us to indulge the belief that it is among the first moral duties of our profession, to attach ourselves more faithfully to our patient, in proportion to his danger, not to shrink with heartless policy from the ugliest operation his condition may require. It is not because we are uncertain of achieving a cure, acquitting ourselves with honour, that we are to abandon our patient : where nicer and more delicate operations fail, we must, at his request, betake ourselves to the more rude and desperate. It is not the barbarous or cruel manner of our operation, that we have to consider, but its tendency to preserve life : it is not by our feelings, but our reason, that we are to be guided ; else all great and important



operations should be abandoned ; surgeons would decline operating for the stone or even trepanning ; for these also manifestly endanger life, and are attended, even in the most skilful hands, with circumstances of particular cruelty. You know now by experience, in this one case at least, that operations for the cure of polypi, to be successful must be in some degree cruel : operations within the narrow passages of the nose and throat, like those of midwifery, where we are forced to introduce the hand and instruments, require perseverance, even violence and determined courage, more than skill or delicacy : and in both kinds of operations, these natural passages bear, without essentially suffering, a degree of violence, which those unaccustomed with practice would be afraid to use. Hæmorrhages from the womb, or from the nostrils, and the violence necessary in extracting a polypus, or delivering a woman, are such as would terrify a timid man, and prevent him from performing his most necessary duties ; whereas to the man of experience and courage, these considerations are but an incitement to do his work resolutely and speedily. From this feeling it is that the fear of a patient suffocating or bleeding to death, incites the operator ; like personal danger, he feels that the present fate of his patient is in his hands, he acts by an impulse like instinct, he is unconscious of the efforts he makes, and accomplishes things during such a struggle, which, in cold blood he could not do. This is the kind of merit that the operator had in this singular case.

Often the methods of the older surgeons are so incorrectly, or at least so indistinctly related, that we learn little more than this, that wherever the polypus was sufficiently large to project, they could never resist the desire of extracting it by main force : they seldom used the knife, or even cauterized the roots of a polypus. But Purmannus appears to have approached to a better manner than any of his predecessors : for while his assistant or apprentice, pulled upon a great polypus, which hung pendulous from the nose, as large as a Muscadel pear, he introduced the forceps towards the root of the tumour, and pinched it off : and indeed it has often occurred to me, that should I ever fail of extirpating by the ligature, those great polypi which tend backwards to the throat, and depress the palate, I should operate, not as these gentlemen have done, by slitting the palate, by cutting across the tumour, when it appears behind the palate, or pull with great forceps introduced by the mouth ; but in examining the disease I should, by feeling with a bent probe, or various shaped hooks, search the nostril for the root ; if I could then hook the neck of the tumour, so as visibly to move the body where it appears in the

throat, I should be sure of my stroke, and proceed with confidence ; if fixing a sharp hook into the tumour behind the palate, and passing a blunt one into the nose, I could move the tumour alternately upwards and downwards, I should then be able, either by pinching with the forceps, to pinch off the root, as Purmannus seems to have done ; or rather, following my usual method, I should pass one of the knives, small and bistoury-shaped, such as I have hitherto used, deep into the nostril, and cut the root there : and take notice, that the surgeon who, in handling a great guttural polypus, reaches its root by the nose, is sure of cutting it in the narrowest part of its neck, close by the spongy bone.—This operation, if dexterously performed, would be speedy, almost painless, and as effectual as if the tumour were cutaneous ; and the hæmorrhagy would be very slight indeed, and easily suppressed by the plugs. I have constantly observed, that the hæmorrhagy which is dangerous or fatal, is that only which proceeds from the universal ulceration, and an extensive surface ; not that it proceeds from the small root of a polypus, or the stroke of the knife.

There is yet, among the practices of the older surgeons, one which, though the most obsolete, deserves, I think, the attention of a practical surgeon in an especial manner ; because it relates to many of his operations, and may, I think, suggest occasional methods very useful ; it is an operation not very distinctly defined, otherwise than by its name, which expresses the purpose of it, viz. The *Compunctio Polypi*, or, as I think I have somewhere read it, *Comminutio Polypi* : it was a lacerating or transfixing of the root so as to kill the body ; and though it seems to have been performed according to no very regular nor established plan, is yet commemorated by various authors.—Heister mentions it in very brief terms, “ There are yet several methods (says he) of removing polypi ; those which are recent will sometimes shrink and disappear, by repeated puncturations or scarifications with a scalpel or lancet, as Severinus asserts he has experienced.” Hildanus gives the title *De Compunctione Polypi* to his ninth chapter, and speaks respectfully of this operation of Severinus. He describes it as an operation performed by itinerants rather, whose method was not expressly known, than by regular physicians, and says, “ The report goes, that they tie together three long needles, and placing the head of the patient in a favourable posture, they scarify the tumour with the points. They then anoint the punctured part with oil. No ill consequences are found to ensue ; the process is repeated from day to day, and the polypi shrink and waste till the patient is in a little while restored to perfect health. Such,” says Hildanus, “ is the method sug-

gested by Hierocles, a celebrated writer in the veterinary art. Nor do I see why an operation so gentle should not be transferred to ours?" Nor can I imagine a reason against a practice so likely to prove successful; so generally believed among the older surgeons to be profitable in the small spongy and bloodless polypi, which occupy the nostril alone.

It is reported, that the method of killing a polypus by a ligature, drawn high round its roots, and tightened from day to day, is of ancient date. But though I willingly commend, and as willingly borrow from the works of the old surgeons, I find nothing to praise in their manner of applying the ligature, nor indeed any thing but their boldness and courage, in grappling willingly (sometimes, it must be confessed, after having bargained for their thirty or fifty crowns,) with the most bulky and formidable polypi. Ligatures, no doubt, they did apply; but assuredly they had no other design, than to save that blood, which the patient could not but lose when they cut them off with their bistouries. The design of pushing up the ligature to the basis of the tumour, never entered so far into their system of operating, as to lead them to think even of pushing the loop up to the root with a forked probe. Glandorpius passed a thread of strong silk round the polypus, drew it tight, secured it with a knot, and then cut off the tumour close to the ligature. "But to perform this operation successfully," says Heister, "it will be necessary to extract the polypus as far as you can out of the nose by pliers. This too must be done gradually and gently, lest you break off the tumour *before* you have made the ligature; it must be left upon the part *after your abscission*, till it is spontaneously digested off; and thus you cure the disorder *without running the risk of a profuse hæmorrhagy*, which is sometimes such as to kill the patient, especially when the polypus is removed by avulsion." Such were the purposes of the ligatures, used by the older surgeons; it was a tourniquet, merely intended to prevent the loss of blood in their rude amputation of the tumour. Heister seems to have had a consciousness of the imperfection of this method, and to have sought a more effectual manner of fixing the ligature. In the case of an old lady, afflicted with polypus, he struck his ligature through the body of the tumour within the nostril, but far from the root.

But all these methods were violent and rude. Seldom did the older surgeons affect gentle means: never indeed, that I recollect, except in this solitary instance, when they stood in the point blank danger of disgrace from hæmorrhagy, when cutting with their crooked knives.

They scrupled not to slit up the nostrils; and the cleaving



the palate, with the first stroke of their bistoury, from the uvula to the bone, was no uncommon way of making room for cutting the polypus itself at the second stroke. "Before I conclude," says Garengeot, "I must mention to you, that often polypi so entirely obstruct the nostril, as to prevent the possibility of introducing instruments to grasp the tumour; and in such circumstances the surgeon has no choice, but must *DILATE the nostril with a cutting instrument*. The sole difficulty is to know at what point, or in what direction. These are polite terms, "dilating the nostril with a cutting instrument," for slitting it up with a bistoury; and where the only difficulty was, about the direction, that would not stand long in the way of a surgeon of this complexion.

Such was the horror of surgeons at this disease, or rather at this stage of it, that they seem to have thought no way exceptionable, that afforded the slightest chance of destroying the tumour. Petit, Garengeot, Dionis, Le Dran, Heister, Levret, and Tulpius, all the best authors, mention every possible method with equal commendation, as if the surgeon had no choice nor limits in his operation, but were to twist, tear, burn, pull, and destroy, by whatever methods he best could, a part at least of the polypus, if he could not unroot the whole. They were; you will find at all times, as ready to slit the nostril, as to commit any less remarkable atrocity; and no operation was so universally applauded, as that of slitting the palate. "We cannot," says La Faye, "extirpate by the nostril, polypi which descend backwards and depress the palate; for what we see of such polypi in the nostril, is but a small portion, which easily follows the body of the tumour, when it is extracted by the mouth; and to extract it by the mouth, we must imitate the manner of Petit, viz. *first, divide the fleshy palate with a bistoury*, and then catch the polypus with crooked pincers on the fingers."

This operation of cleaving the palate they never shrunk from, because it is neither bloody nor dangerous, and it facilitated their main design; the consequences they never reflected on, which, though in some degree distant, are not less melancholy. For, whatever the patient, thus treated, does not swallow with great precaution, rather by letting it glide over his throat, than forcing it by the usual effort, rushes upwards into his nose; and his voice resembles that of one who had lost his palate by the venereal disease.

To these rude and cruel methods, the best of us may need to have recourse; and it is a merit to bend up our mind to such cruelties, for our patient's safety: but when the polypus has attained this size, and fills the nose, and depresses the palate, its bulk is peculiarly favourable to the operation of the ligature:

and as it has not yet destroyed the bones, the operation is almost always successful. I like to be diffuse in my descriptions and character of diseases: in my directions for operating, I at least wish to be perspicuous and concise. You would imagine the apparatus for applying the noose round a polypus to be multifarious and complicated; you would at least imagine the tubes and other instruments of Levret, to be essentially necessary, and cannot perhaps at this moment imagine that any contrivances but what were extremely ingenious, could be at all successful: it is quite otherwise: I have often tried those much reputed instruments, with perfect confidence in them, and uniformly, I concluded with my fingers, the operation which I had tried in vain to perform with this apparatus. The operation I am going to describe requires address and courage, but no instrument great or small: indeed the instruments are so described, that I am persuaded those who write in praise of them never use them. I require nothing but a piece of fine silver-wire, and my fingers: I have frequently used cat-gut, but always found it soften, untwist, and become altogether unmanageable. Ligatures of wetted thread are quite flaccid, and difficult to apply: a silver-wire, of the size of a common harpsichord wire, passes easily through the nostril, preserves its looped form in the throat, is easily cast round the polypus, and easily twisted, in a gentle degree, so as to kill without cutting it.

*FIRST. How to pass the wire through the nostril to the throat.* You have already felt the tumour depressing the palate, and estimated its size: you have repeatedly placed the patient before you, and made him open his throat, and depressed his tongue, so as to occasion straining and retching, which unfolds all the parts, and shews you their size and relations: you now place him before you opposite to a light, supported by assistance, resolute to bear whatever you do, and reconciled to it by seeing that you have only a piece of silver-wire in your hand. You take the piece of wire, about three feet long, double it, and smooth and arrange the doubled part, by pressing and modelling it in your fingers into a neat noose, a little open and ready to expand when it gets into the throat, but small enough to pass through the nostril; and taking this loop betwixt your fore-finger and thumb, you enter it into the nostril, and push it gently along. However big the polypus, you find that the loop of silver-wire glides easily and smoothly along; find it sometimes stopped, and then it bends and resists, but withdraw it a little, and then push it, and it will go on. I have never found occasion to use any instrument for conveying the loop to the throat, except when the bones were destroyed; a case in which I can hardly counsel you to attempt the cure. I have

thus imagined, that the wire was turned aside into the antrum Highmorianum, and have used a catheter, cut or open at the point as a canula, for passing the wire, and then pushed on the wire till it could be seen and caught in the throat, and then withdrawn the catheter.

SECOND. *How to hook out the wire from the throat.* You cannot be one moment at a loss to know, when the wire reaches the throat; for while it passes along the nostril, it excites not even sneezing or watering of the eye; but the moment it passes the uvula, or touches either on one side the tonsils or the back of the pharynx it excites a sense of suffocation, and a desire to cough, with sneezing, which the patient cannot a moment restrain. Upon looking down into the throat, the loop of the wire is seen, it is easily hooked out by a blunt hook, or caught with common dressing forceps, or a bended probe. Then quickly push the wire onwards through the nostril with the finger and thumb of the left hand, hook it forward through the mouth with the crooked fore-fingers of the right hand, and as soon as you have got the loop without the lips, all is quiet again; yet in all cases the hooking it thus is a painful struggle, though in the hands of a dextrous surgeon, a momentary one. Often you will find the loop of your wire passing actually down into the glottis; the patient instantly cries, coughs, and strains violently, while the face becomes turgid, and the eyes stand in tears: instantly, knowing what kind of an accident has happened, you withdraw the wire a little towards the nostril; by this motion you retract it from within the glottis, and you keep it carefully there till the straining ceases; then you push it gently on again, keeping the mouth open, and catching the wire the moment it appears behind the tonsils. In this part of the operation, there is much address and some practice requisite; first, in stealing the wire on so gently that the patient scarcely feels it; secondly, in diving keenly and resolutely with the finger into the fauces, the moment the wire begins to excite the throat, or becomes visible behind the velum: and lastly, in quieting and composing the patient for the next part of the operation, viz. that of casting the noose.

THIRD. *Of spreading the loop of the wire, and casting the loop over the polypus.* You now draw out the loop of wire entirely from the mouth, and spread it wide; you prepare to retract with the right hand, in favour of the left; you take the two ends of the wire, which project from the nostril, firmly in the left hand, twisting it round the fingers for a surer hold; you gather the fingers of the right hand together with the thumb, so as to form a cone, and taking the loop of the wire upon the conical fingers, you, by drawing the wire up towards the nostrils,



tighten the loop so upon the fingers, that it is not easily displaced in the next step of the operation: you now prepare for that effort, by which you are to carry the loop over the biggest, and most pendulous part of the tumour; and in this effort you are to succeed at once, or to fail; it can last but for a moment: the patient, while you make this effort, cannot breathe, he feels the severe pressure of your fingers in his throat, he is suffocating, struggling at once for breath, and striving to vomit; his eyes are staring, and his visage inflated: you dare not keep him one moment in this condition; you must act resolutely and dexterously. Your purpose is to push the ligature home over the bulk and body of the tumour with the right hand, while with the left you draw the ligature backwards towards the nose: you first allow the patient time to take breath, and be composed; you let him fairly understand what you design to do, and how: you prepare yourself by making the wire tense, by pulling with the left hand, and fix the loop by spreading and distending a little the conical fingers of the right: you then, in one moment, retract the ligature steadily, but speedily with the left hand, while you plunge the loop into the mouth, and carry it quite to the back of the throat with the right. The tumour, which in your previous examinations you were able only to touch with the points of your fingers, you are now, in the moment of operation, using every degree of violence, and pushing your hand boldly and deeper into the throat, able to grapple with, and by hooking and grappling with the points of your fingers, you get it in some degree within your grasp; and pulling the bulk of the tumour towards you, with the crooked points of your fingers, and slipping off the ligature from the points of your fingers by bending them still more, you at once turn it over the lower part of the tumour with the right hand, and pull the noose up towards the root of the tumour with the left.

FOURTH. *How to hitch up the ligature close to the root.* With every operator this must be a matter of great anxiety, for he has no sign nor mark by which to know, that the loop is carried to the highest possible point, nor any sure means of doing so. Do not let me deceive you, by representing the simple methods I am going to speak of as infallible; so much the reverse, that though they seem to me at once the best and the most simple, though I have always entered upon this part of the operation with confidence, I have never finished without a degree of diffidence and uncertainty.

I have often found, especially in firm and smooth polypi, that I have by that quick and forcible retraction of the ligature, by which I draw it up behind the polypus, hitched it at once so high, that no after-operation was either necessary or useful.

But the attempt to hitch the ligature high, and place it correctly round the neck of the tumour, can never be superfluous: the instrument I most frequently use is a boy's catheter, or one of the smallest size, cut across about the middle, or somewhat short of the middle of its curve. Taking one of the ends of the wire as it hangs out of the nostril, I pass it through the tube of the catheter, and then holding both ends of the wire or noose firm, I pass the catheter deep into the nostril, along the wire, till I imagine the point of the catheter touches the tumour; then, by tightening both ends of the wire, and turning the point of the catheter upwards, I try to raise that side of the wire or ligature as high as possible; I then withdraw the catheter, pass the opposite side of the wire through it; I hold all tight again, and try to raise that side of the noose as high as possible; I then pass both wires through the tube of the catheter at once, push the catheter along till it touches the tumour, pull both ends of the ligature so as to tighten it round the neck or smaller part of the polypus, and, twisting the wire fast round the handle of the catheter, I leave it there. More frequently I use for this latter purpose a shorter tube, or very small section of a catheter, a little bended, which, when fixed, projects no more than an inch, or an inch and a half beyond the nostril, and is less apt to be discomposed by accidents during the day, or change of posture while the patient lies asleep. Sometimes I have run along the line of the ligature to hitch it higher, a probe with the point bent. Sometimes, giving the loop a twist in its middle, I have, before introducing it through the nostril into the throat, tied a ligature of waxed thread, or cat-gut, to the loop of the wire, the twist of which keeps the *regulating ligature in the centre*, so as to raise the proper ligature and adjust its place. When a ligature of wire is thus mounted and introduced into the nose, and the loop caught in the throat, and retracted through the mouth, this assistant-ligature is fixed on the centre of it; the noose of wire is then carried into the throat upon the conical fingers of the right hand, and cast over the tumour, and retracted behind it, as I have already explained, and of the three ends hanging out of the nostril, you raise, first this supplementary ligature, by running the catheter along it, and thus you make sure of hitching the centre of the loop of silver wire higher, after which you carry each of the sides higher, by running the tube along them, and if you know the windings of the passages, and have formed a true conception of the form of the polypus you have to deal with, your chance is tolerable of placing the ligature very true. If there be a second polypus, one in the nostril as well as one in the throat, this method enables you to carry the same ligature at once

round both. I have occasionally done this with the common-eyed probe, but the eyed-end of the probe, though from its flatness it glides pretty well along the sides of the tumour, is too big to turn easily, and too sharp in its point; but a surgeon in the country may, by clipping off the point with scissars, and hammering and rounding it upon a stone, fit it for this use. I have occasionally used for this purpose a piece of stiffer wire twisted into a loop, for conducting the ligature down into the throat, or placing it correctly, and hitching it high upon the neck of the polypus. In performing this operation then I take only a catheter nicely cut and smoothed, a few waxed ligatures and catguts of various dimensions, small and flexible wire, for forming the noose, and thicker and firmer brass wire to use for this purpose, with cutting pliers, and common pincers, to turn and twist the wires into whatever shapes best suit the occasion, or the accidents of the case.

FIFTHLY, *Of the effects of the ligature on the tumour, and of the time of its separation.* When you first draw the noose, the stricture is followed with extreme pain, the eyes fill with water, the patient cries out and retracts his head, and violent sneezing follows; during the whole of the first and second day, the pain is like that of severe toothach; and, upon tapping with the finger upon the catheter or probe, you find it firm. On the third day, a thin and bloody serum begins to distil from the noose, and continues to flow in great profusion, the probe or catheter is blackened by the putrid taint of this serum, the polypus, if any part of it project so as to be felt, is perceived to be flaccid, the breath begins to pass through the nostril, and the patient, who had felt his fauces choaked with the polypus, and was deaf from its pressure, now swallows easily, and hears very acutely, because the tumour begins to shrink.

These are the first suspicious signs of the fading of the polypus: the fetor of the matter increases on the fourth and fifth days, the probes and silver wire are still more blackened, the wire manifestly has become looser from the shrinking of the tumour, the catheter now shakes from side to side, and, that it may completely destroy the polypus, you find it necessary to draw it a little closer in proportion as the tumour has already yielded. Not unfrequently it happens, that at this time the probe or catheter comes easily away; but if the ligature continue to retain its hold, it is but for a day, or at the utmost two days longer; and though the pain is not renewed, the polypus, being now less sensible, the parts are still more blackened, the discharge is extremely fetid, thin, and copious; some blood usually flows at this time, the swallowing improves, and the hearing grows too acute, irregular, and confused; the tube



falls away on the sixth, seventh, or eighth day, and often it happens, that the tumour melts away so entirely, and is resolved into this gangrenous ichor, that no perceptible portion of it falls away: sometimes, continuing more entire, it drops into the throat, and the patient rejects it; often when it drops into the œsophagus it is swallowed, and is passed undigested by stool; sometimes the patient is conscious of having swallowed the tumour, but more usually it passes over the throat insensibly, and during sleep. I have known it happen, especially in the hands of ignorant people, that, after the polypus has dropped off, and actually been passed by stool, the tube and wire have kept their place, without the reason being at all suspected: it is this, that the loop of the ligature is larger than that narrow slit of the nostril, through which it should pass, and thus it hangs suspended, and I have known it hang so a month, but loose, moveable, and easily taken away. I do not know that the loop of wire ever needs be left, even in the most bulky and cartilaginous polypus, beyond the eighth day.

These are, I believe, the most material rules and directions I have to give you; but there are some of them, perhaps, that I ought to explain or to impress. The operation which use has made easy, or frequent success has inclined us to prefer to all others, we are apt to praise too much; but I am conscious, that it is a serious duty to represent this not favourably, but truly. The operation of noosing a polypus, is not suited, in any degree, to these small and soft polypi, which occupy only the nose, but to those big and solid ones, which depress the palate, and are felt in the throat. It is most natural for the young surgeon to believe a polypus the more formidable, the greater its size; but indeed it is impossible to grapple with those which are not large; those are most easily grappled with the points of the fingers, and noosed with the loop or ligature, which are very conspicuously large.

Some apparatus you will assuredly require; you would imagine many and curious instruments necessary; you must have small catheters, or other tubes, you must have a blunt hook for hooking the noose forwards, as soon as it appears in the throat, a pair of common dressing forceps, which indeed I find best, silver wire of various thickness, and pliers for twisting, and cutting forceps, or strong scissors, for dividing it; but having had much experience in such operations, and seen every variety of the disease, I protest I know of no circumstances in which I would not prefer a bit of silver wire managed with my fingers, and passed down into the throat, without a tube, drawn out with dressing forceps from the throat, formed into a loop, and thrust over the tumour with my three first fingers of the right

hand, in a conical form, to the most ingenious instruments that ever were devised.

An operation so effectual and radical, and yet so little alarming, I do not know; for the surgeon presents himself without instruments, with only a bit of silver wire in his hand, and with the professed intention too, not of cutting, tearing, or cauterizing, but merely of casting a noose round the tumour, as round a wart on the surface of the skin. Nor are the efforts made in applying that noose, though violent, at all dangerous; they are not fatal, like those of an unskilful surgeon groping in the lacerated bladder for a stone; there is here no incision, and the surgeon is grappling for a hold of an uninflamed tumour, in natural passages, which, though they be inflamed by his unskilfulness or rudeness, (and I have seen them inflamed so that the whole throat has swelled exceedingly) yet such inflammation does no material harm.

But, though harmless, the efforts necessary for noosing the polypus makes it a moment of great agitation and anxiety for the surgeon: his patient strains, and suffocates, during his attempt; however long it lasts, breathing is suspended; the eyes are filled with water, the blood gushes from the mouth and nostrils, the fingers, or rather the hand of the operator, is driven deep into the throat; and the patient is held staring, and struggling, at once terrified for suffocation, excited to vomit, and alarmed and pained by the pushing of the operator, who is obliged to push his finger deep, before he even feels the tumour behind the palate, who grapples hard before he gets the lower part of it within the grasp of the fingers, and pushes still more violently, and struggles much, before he can pass the loop of the wire beyond and over it: it is a painful, and to the spectators an apparently desperate and unavailing struggle; it is difficult to perform in the living subject, for in one moment of violent struggling a thing is to be accomplished, which you have no opportunity of trying previously in the dead body: it is also to be accomplished at once, for if the operator suffers himself to be once foiled, he may be so fifty times, and never succeed: never, therefore, attempt this operation in the presence of students, nor think of it as an exhibition of skill, but privately, with one or two chosen friends, when having no concern about your own reputation, or shame or fear of being foiled, your whole thoughts are occupied with your patient.

Like the operations of midwifery, such as turning the child, or dilating the womb in floodings, this requires a degree of strength, and a sort of cruel violence, which the inexperienced surgeon cannot allow himself to use; insomuch, that one who has often performed it, forgets that there is any skill required,

and knows not how to describe the art he does use. So great is the force, that I long imagined that nothing but courage was necessary; I was not aware, that in a matter so simple, there was occasion for particular address; and among many, whom I have seen try in vain to noose a polypus, I represented to one gentleman, that he had but to push his fingers more courageously into the throat, and he could not fail to distinguish the polypus, and after a short struggle to noose it; this was the only point of my instructions in which he did not fail. More desperate struggles, I confess, I never witnessed; and when, after twenty attempts, I perceived that it was impossible he should succeed, I found it as difficult to disengage him from the patient as a mastiff from his hold, he seemed furiously resolved not to be defeated in what was esteemed easy, and necessary for the patient, nor disgraced before a whole theatre of students.

The surgeon must, in performing this part of his operation, be prepared to use great force; he first draws out the loop from the throat, then spreads it, then passes the three first fingers of his right hand in a conical form into the loop, then retracts the wire in the nostrils with the left hand, so as to straiten the loop upon the fingers of the right hand, that it may not shift, then pulling back the wire with the left hand, he gradually introduces the right hand into the mouth, conducting the loop upon the points of his fingers. He next prepares for the final exertion, by pulling the ligature smartly with the left hand, thrusting the right hand forwards into the throat, distending the mouth more and more, and pushing the hand deeper, till he not only feels the tumour, but passes beyond it with the points of his fingers, hooks it towards him with the crooked finger-points, as in the motion of tickling, pushing the ligatures up with the backs of the fingers at the same moment, and pulling it very strongly back into the nose; the throat all the while re-acts and assists him. This, as far as I am conscious, is the manner in which I have successfully noosed the polypus, and in no instance have I yet failed wherever I conceived it to be of sufficient size for such an operation.\*

\* It is easy to imagine the manner, and still easier to understand the effect of these manœuvres, but to execute them is extremely difficult, as I am now persuaded; for I have seen surgeons, by no means awkward or ignorant, miscarry most inexplicably in this simple operation of applying the noose.



## HISTORY OF THE DISEASE.

“ The case of A. Gow is one, I believe, particularly suited to convey clear impressions of this second stage of the disease, in which the tumour is bulky, fit for the application of the noose, and not yet accompanied with any caries of the bones. Gow is a hard-working young man of twenty-one years of age, apprentice to a mill-wright in Blair Athol ; his polypus is big, and of a stony hardness ; it choakes the fauces, as if a fist with its knuckles downwards were thrust into the throat ; the chief bulk of the tumour descending from the back of the nostrils, pushes out the soft palate into a great convexity, so that it presses the root of the tongue ; two large knuckle-like tubercles of the polypus project below the curtain or moveable palate, and on the center of the convexity formed by the protruded soft palate, are two long gashes of incision, made apparently with the expectation of letting out matter by his country surgeon, and now in suppuration. There is no part of the polypus projecting from the nostril, the bulk of the tumour is in the fauces, yet the face is deformed, the nose being inclined to one side, as if a branch of the polypus were lodged there. There have been frequent and very profuse hemorrhages ; the parts within the nose are greatly endangered by the pressure, which is attended with considerable pain ; but as yet, no matter distils from the nostrils or throat, there have been no intense pains in the cheek, the maxillary and nasal bones seem firm and sound, the disease is advanced to the farthest verge of the second stage, and beginning of the third, in which the bones and Schneiderian membrane fall into incurable ulceration : nothing has saved the patient from such caries, but that the tumour, though very bulky, is but of recent growth ; it is of such a size as to be extremely favourable for operation : before applying the noose, I take the following notes of its progress.

“ The lower order of people are coarse and hardy, very little attentive to their health ; it is not a slight alteration of the voice, slight obstruction of the nose, or occasional hemorrhages, that can alarm them ; thence it happens, that the date they assign for such a tumour, is not the beginning of its growth, but that stage of its progress in which it occasions particular distress. It is no more than six months since Gow suspected any thing to be wrong in his throat or nostril ; he had tooth-ach, and had a tooth pulled, without any possible relation to his present ailment, the first sensible sign of which was hemorrhagy from the nose : during eight or ten days, he seldom rose in the morning without violent hemorrhagy, which sometimes

recurred during the day, or in the evening, but it ceased spontaneously.

“About a month after this first attack, the occasional hemorrhagy returned in all its violence; he bled profusely from the nose, not only in the morning, but at all hours of the day and night; all the usual methods of restraining it now failed, he fell into extreme weakness; and, to use his own homely expression, “seemed to have bled out all the blood of his body.”

“One day when he was out in the duke’s woods, with his master, the mill-wright, cutting wood for their work, he observed, in blowing his nose, that he could not blow with his right nostril; he felt, at the same time, something uneasy in his throat, and directed by this feeling, pushed his finger as far back as it could go, and then he plainly felt a soft lump, obstructing his throat, and hindering his free breathing; and being greatly alarmed, he begged his master to look into his throat, who saw the lump very plainly. Thus you perceive in this coarse country lad, little in the habit of observing his own feelings, and not easily discomposed by trifling uneasiness or diseases, which in a more delicate person, and in a higher rank in life, would have caused great alarm. The polypus was not observed, till after it had occasioned very profuse hemorrhages, and had grown to a very remarkable size.

“The tumour increased rapidly; it was the difficulty of breathing, and uneasy feeling in the throat, that first led him to the discovery; and being sensible that the lump in his throat was still growing, and feeling his right nostril particularly stuffed, he introduced his finger there, from time to time, and was sensible also of a smaller lump obstructing his nose.

“At this period when he had difficulty of breathing, with a total obstruction of the right nostril, difficulty of swallowing, with a degree of deafness in the right ear, he had no distinct tooth-ach, but a general uneasiness, sense of pressure, and confused pain in the head: but he had no returns of the hemorrhage, and only a thick, white, and starch-like mucus, a mere increase of the natural secretion distilled from the nose.

“In this stage of the disease it was, that he first applied to a surgeon, a very ignorant one, who performed a singular operation; the incisions which he made are still in a state of suppuration. The lad went to this surgeon to complain of difficulty of breathing, and a lump growing in the throat, which he could easily see and feel. The surgeon having heard of swellings of the tonsils, and obstructions of the throat, and read perhaps of the operation of scarifying the tonsils, to let out the matter, knowing nothing of diseases, and apprehending that the tumour he saw could be nothing but the swelled tonsils, he proceeded to

make two long and deep incisions. This bulky and firm polypus, having pushed down the velum, had depressed it to a right angle with the bony palate : and the soft velum, with its uvula, was thus protruded forwards in the mouth, in the form of a tumour, so far, that you could easily touch it with the finger. He perhaps imagined it some great abscess of the tonsil : he made, with what instrument I know not, two long incisions, each more than an inch long, parallel with each other, down through the very centre of the velum ; and the same pressure which thus extended the velum continuing and increasing, has so dilated the two incisions, as to prevent them healing : they are to this day in a state of suppuration, with red and hardened edges, though it is full two months since they were made.

“ The surgeon said he would come back and complete this operation ; what he designed next to do it is difficult to conjecture ; but fortunately for Alexander Gow, the operator, while meditating upon the operation, died, probably from solacing himself after hard rides with too strong a cup ; and soon after his death, Gow came to town to have some operation performed.”

#### NOTES OF THE OPINION IN THIS CASE OF GOW.

“ The tumour is big, distinctly felt behind the velum pendulum, easily grappled with and noosed : the stage of the disease is urgent, the pain, deafness, stupor, and affection of the voice, shew the pressure to be such that we cannot for one moment reckon upon the part continuing sound, the operation should be immediately performed.”

The annexed figure is a true drawing of this polypus which I found of this size, exceedingly hard and cartilaginous, and so firm, that a delicate knife might be broken on it, before it could be divided. Such is the tumour, which would in former times have been cut out, or torn imperfectly away, after cleaving the palate not partially, as was done by the Dunkeld surgeon, but entirely. I extirpated this polypus with a noose of silver wire, after the usual severe struggle in passing and adjusting the noose ; whether the point (*a*) be that small projection which was felt deep within the nostril, I do not know ; but the broad surface (*b*), which either implied that this polypus had not a narrow pedicle, or that the ligature had not been fortunately placed, alarmed me. I was long without tidings of this young man, and feared lest he had been cut off by a return of the disease ; but just now, at the distance of eight years from this operation, I have recognised him a waiter in a tavern, and in strong health, and grown a stout and athletic man.





In another case of a boy of fourteen years of age I applied the ligature with the usual painful struggle, but he bore it well : the tube for tightening the ligature stood very firm : he was, on the 4th day, relieved of the tube and ligature, which dropt away ; and at the same time, of his deafness and stupor, recovering with all his natural voice. But, though I have noosed many polypi successfully, in this I certainly failed ; I imagined I had noosed both polypi effectually, for both dropt away, and he was conscious one night of swallowing that one which choaked the fauces ; but either the polypus projecting forwards into the nostril, had in part escaped ; or, from the ligature embracing both, they had been imperfectly compressed ; or there had lurked behind them a third polypus, which indeed I conceive to be the most likely conjecture ; but the disease actually returned, in a few months he came back to me with a voice as much affected, and the guttural part of the polypus as bulky as at first. Though mortified, I was not discouraged by my ill success, but addressed myself again to the business, and noosed this new tumour, taking every precaution to carry the ligature quite up to the root, and I am confident this boy was, by this second operation, perfectly cured, I saw him grow a fine stout young man, and I must have been his sole resource had the disease returned a third time, for the operation was bloodless, not at all alarming, and little painful, and his relief perfect. When I operated on this polypus I supposed there was but one root to both tumours, but I have since changed my opinion on this sub-

ject, and am persuaded that, wherever there are two or more polypi, they are distinct in their roots, as in their bodies. This was just Gow's polypus in embryo, and I speak of it to you as an example of two polypi; and a warning of the unlooked-for disappointments you will have to brook, if you are engaged in this line of practice.

## SECTION III.

*Of the Third and last Stage of Polypus.*

The last and fatal stage of this disorder you will know even at sight by strong characteristic marks; by the humid half-closed eye, moving slowly and half drowned in water; by the snuffing voice, the total deafness, the stupor and languor, approaching to apoplectic, the distorted nose, and pallid transparent wax-like face; while the loose nasal bones, and puffy cheek, denote the incurable stage of the disease; the puffy integuments and softened bones, and fetid matter running from the nose, prove that all you have it in your power to do by an operation is to save the patient for a little while from dying of hæmorrhagy.

"When first I visited Mr. Cameron, his whole form and countenance and state of suffering struck me: he was a fine young man, about 25 years of age, tall, athletic, and had been noted for his strength in all kinds of exercise and feats of strength. His form was emaciated, his face deadly pale, with a ghastly transparency of skin, which gave his countenance the appearance of modelled wax, this proceeded from the frequent loss of blood. There was a remarkable torpor and heaviness in the eyes, which were half closed; for hæmorrhagy brings on a languor and sleepiness which, in a case like this, is increased by an actual disorder of the brain. His nose was inclined much to one side, and his face greatly deformed, not merely by the rising of the cheek-bone, and the dilatation of the nostril, but from the swelling of the whole of the right side of the head, which seemed universally enlarged. The right eye was turned obliquely in its socket, and almost closed; a large and massive branch of polypus projected from the right nostril; and looking into the throat, I saw the soft palate pressed forwards by a second polypus as big as the fist; from continual pain of the caries, the tears streamed unceasingly down his cheek, so that he saw confusedly; the saliva flowed continually from his mouth, and involuntarily, while a foul, black, and corroding sanies, distilled from the nostril, and excoriated and

swelled the upper lip. He said his head was continually tortured, as if squeezed from temple to temple in an iron vice.— He sat pale as a spectre, hanging over the fire, though in the hottest season of the year, his knees almost touching the grate, resting his head upon his hand, and waving it to and fro with continual agony, moaning and complaining. His visage was pale, his lips bloodless, and every thing about him denoted despair, and the most perfect indifference about life. He was so deaf as to be nearly insensible to noise; you could scarcely make him understand you, even when you halloed in his ear; he was unconscious when any one entered the room, or shut the door; his teeth were loose on the affected side, and some had dropped from their sockets; he was able to swallow liquids only, and, partly from this cause, but rather from despair, he refused all sustenance, drank only water to slake his thirst, and to every kind or encouraging expression he always replied, ‘He knew he could not be cured, he wished he could die.’

“At the distance of two years from the commencement of his complaint, this poor man requested my assistance in circumstances altogether desperate, when little could be done, even to prolong life, where to save it nothing but a miracle could avail. I was induced by his earnest and imploring manner to do whatever was in my power, and, encouraged by this reflection, that, in such desperate circumstances, every partial success, though it seems simply to prolong life, is followed by an interval of tranquillity and hope; and by this rule and feeling I shall always be guided, doing as I would be done by, persevering always even after all hope is over, if conscious that I am doing no direct injury. I have told you how he was exhausted by suffering, how distracted with pain, how overcome with stupor, except in the moment of violent suffering, and when I tell you that, upon the slightest intimation, that the prospect of saving him was very small by any operation, he refused food, I represent in one word his despair. The hæmorrhage was particularly terrifying; and he obtained a promise of me, that, upon the first return of it, I should introduce the plugs to arrest it: from this moment I was entirely embarked in a desperate cause; when the hæmorrhagy returned, which it did with violence, and at midnight, I passed a ligature and drew up plugs from the throat to the back of the nostril, and thus prevented him actually expiring, for he was now too far exhausted to bear loss of blood.

“I now called a full consultation, and was not merely permitted but advised, at his request, to try every method: I proceeded by passing a wire through the nostril, and drawing it



from the throat into the mouth, to noose the main tumour, which was bulky, depressed the palate to right angles, was very visible in the throat, and felt, while I grappled with it, as bulky as the fist. The tube which I used for tightening this noose, stood out from his nostril very stiff, having a very firm hold : I had also been careful to include a polypus which hung down in the nostril, and thence expected after the operation of the ligature, that the passages should be tolerably clear. The tube continued rigid and very firm for five days ; he had in the very moment of tightening the wire, and for several days, a poignant excruciating pain, in all that side of the head, but especially in the teeth and ear ; the matter flowed, blacker, and more fetid, discolouring the wire and the tube. On the fourth day the wire slackened, and the tube could be moved a little from side to side, I therefore drew the wire tighter : on the fifth he was suddenly restored to his hearing, he was sensible of swallowing the tumour, the wire dropped off, his pains vanished, he swallowed easily, and he was so elated with hope and confidence, that he ate heartily, drank his wine, took exercise abroad, and felt assured of what no prudent man could promise, an absolute cure.

“ This was the period, in which having made way into the nostrils so as to operate freely, I should have searched boldly with my finger, introduced my knives, forceps, and caustics, and resolutely extirpated the branches, and roots of the polypi ; if I was guilty of any dereliction of duty, it was from no selfish nor trivial motive ; this was a case so desperate in all respects, with a stupor so manifestly implying an affection of the brain, that I was afraid of causing inflammation and sudden death ; if at my next operation I was more resolute, it was from despair, joined to the earnest intreaties of the patient. In less than a fortnight I felt the tumour from the nose rising again ; at this time, restored to strength, and spirits, and the nostril open, he could blow through it so freely, as to dash out the foul matter and blood with great force, and my fingers could pass deep into it. There was no sensible tumour in the throat, but in a little while the nostril was much obstructed ; in a little longer, the tumour could be felt also in the throat ; the hæmorrhages returned, so that he was in danger of sudden death.— His entreaties were renewed, and Dr. Monro, Messrs. Wood, and Harkness, and the other Gentlemen, met again in consultation, added to the patient’s wish of having these attempts renewed, and were assembled again the day following, to assist in the operation : but I could not noose the polypus as at first, not because of its lesser size, but because when I grappled with the tumour in the throat, it recoiled into the nostril ; when I

resisted this by plunging a finger deep into the dilated nostril, and met and resisted the tumour there, it seemed to recede into the antrum Highmorianum, and when I pursued the now moveable tumour, with the finger among the cells, I found, to my inexpressible horror, that every bone and bony cavity was entirely carious: the partition which divides the antrum from the cavity of the nose was quite destroyed: the polypus occupied the cavity of the antrum: the edge of the vomer rough, carious, and disengaged from its cartilage, met the finger, and the nasal branch of the upper maxillary bone was rotten: the polypi felt soft and mucous, and the whole seemed to be one mass of corruption.

“ Since our operation was begun, though it could, in these circumstances, be nothing but unavailing, still the patient’s intreaties, together with our natural desire to give him every chance of life prevailed. To prepare for this severe operation I passed a ligature by the nostril to the mouth, fixed a plug of lint to it, kept it ready to be drawn up into the back nostril, in case of hæmorrhagy, which our patient could ill bear, introduced then the forceps, and caught at whatever branches of polypus were within my reach; turned the instruments in every direction, and cleared the nostril by every means, however rude, and indeed so cleared it that he could blow freely, and dash out a clot of blood, mixed with fragments of mangled polypus, to a great distance, and without permitting him to lose even one ounce of blood, which indeed he could not have endured; I drew up the plug, and made all close. In three days the plugs were removed,\* the nostril was in full suppuration, and the passages seemingly clear.

“ But the same, or another polypus, soon appeared, small in the nostril, more considerable in the throat; the deafness, the pains, the loss of voice, and the difficulty of breathing soon returned; and the patient, who, during a short respite, in which he had eat, and drank cheerfully, and recruited his strength, fell again into a state of despair; and above all, this fear was most distracting to him, that we should sooner or later abandon him to his fate. The polypus had now attained such a size, that it was again possible to noose it; and the hæmorrhages were such, that he felt distinctly that if nothing was done for

\* In removing the plug, you first undo the knot that secures the anterior plug in the nostril; you then slacken the string, that the posterior plug may fall down towards the throat; if it do not fall down spontaneously, you push against it by passing a probe through the nostril, holding the string at the same time, that the plug may not go quite into the fauces: you put in your dressing forceps, catch it at the back of the palate, pull it forwards from behind the velum, and having brought it out of the mouth, you cut the string in the nostril, you thus extract it.

him, he had not many days to live. The ligature was again passed, and the noose cast over the tumour, and in four or five days, when its operation was compleat, the nostril was so clean; and at the same time so dilated, that I passed the finger, and turned it in every direction with ease, almost to the throat.— But I may say, my finger was hardly out of the nostril, ere the tumour began again to protrude; and on the 12th or 14th day he had a dreadful hæmorrhagy.

“ There was now no alternative but death, or the most resolute operations : I had not then learned to use the caustic so freely as I now do, and considered the partial application of the caustic as disproportioned to the size and rapid growth of these polypi. I resolved to burn, with the actual cautery, whatever remained of these polypi; and to give access freely to their roots, I noosed the polypus, the polypus which presented, and cleared the nostril a third time, and had a large cautery, with a proper canula, forged for the occasion. But it was now the height of summer; the weather towards the end of July intensely hot; the foul and pestilent ichor which excoriated the lips outwardly, passed in such quantities into the throat, that he was seized with diarrhœa; shiverings, and fever ensued: then a state of stupor and extreme coldness succeeded; in five days he became quite insensible, and after lying three days more in a state of complete stupor, accompanied with slight delirium, he expired.”

From this narrative you will learn how much more terrible this disease is than lues or cancer; for, with all that is loathsome or painful in those diseases, it is attended with hæmorrhages, stupor, a confusion of head, and affection of the brain, which I have always observed, is more than hectic or hæmorrhagy, the immediate cause of death.

Since I have represented almost every other form and stage of the disease, let me represent this also, of delirium and inflamed brain, brought on by a rash and ill-timed working with forceps.

I have often found the polypus advanced to its last stage of caries, and external abscess, even in the sixth month after it was first observed; if not actually in the sixth month of its growth, and fatal within the year. So it was in the good woman, whose death I am now going to describe; in her case indeed it would have been so, although no such rude operation, as that I am now going to speak of, had been performed.

“ G. T. a good woman of forty-five years of age, was afflicted with polypus, which had long obstructed her breathing: for half-a year or more, the right nostril had been impervious; during the three succeeding months she had been deaf, and torpid:



the tears flowed continually over her cheek, and the tooth-achy and rending pains of the face and head, became at times distracting. The right nostril was filled manifestly, with a soft and mucous polypus, the eye watery and inflamed; the cheek suppurated and burst, near the canthus of the eye; the whole side of the head was pained, the cheek and jaws swelled, soft, inelastic, and doughy; a purulent and thick matter flowed from the suppurated parts, at the inner canthus of the eye; while a thin and fetid matter distilled from the nostril, and excoriated the lip. Her general head-ach was aggravated by a more pungent, and tooth-achy pain in the nose and jaw: yet she seemed hale, and vigorous; and there appeared no reason to fear such a sudden or dreadful catastrophe from any operation, however rude; let this case then be a warning to you.

“A consultation decided that an operation was advisable, and it was performed by the forceps. To my apprehension, no polypus was extracted: little rags, of a soft and mucous matter, seemed to be squeezed by the forceps into a mere jelly; the forceps were used for twenty minutes, with no great delicacy; a small piece of bone was found among these rags of the polypus; there was not even any remarkable hæmorrhagy: when invited by one of the attendants to look into the largest portion of the polypus, I found it no other than a roll of lint soaked with blood. She was reported to breathe more easily through the nostrils, but for that slight and momentary relief she paid a dear forfeit.

“On the day following the operation, her pulse rose; there were manifest signs of an increasing pain; the pain shot through all her head; she was hot, and thirsty, with a small and rapid pulse; her anodyne draught produced no pleasant nor refreshing sleep.

“On the second day, the nostril, the face, and eyes, were extremely painful, and the shooting pains and confusion of head increased; but all this inflammation was internal, (not the less dangerous for being so,) the eye and cheek were little apparently affected.

“On the third day, the heat, thirst, rapid pulse, and general disorder within the head, were alarmingly increased. The saline draughts, the shaving of the head, and the poultice in which the whole face was involved, availed nothing.

“On the fourth day, at nine in the morning, she was found insensible, and remained so; the pupils of the eyes dilated, the breathing slow, and stertorous, and the bladder paralytic, so that the urine needed to be drawn off with the catheter.

“On the fifth day, she lay in a deep apoplectic stupor, had no stool, passed no urine, was visibly sinking; a blister applied

to the head had its effect ; the sinapisms also inflamed the soles of the feet, but she could not swallow.

“ On the sixth day she continued comatose, sunk gradually during the night, and expired before morning : and upon dissecting the head, the polypus was found a mere pulp of putrid flesh : the ethmoid bone destroyed on the right side, and the vessels of the brain were found turgid with blood ; its upper surfaces suffused with water, and its lower surface in a state of suppuration. Here are the terms in which the appearances, on dissection, were noted down.”

#### DISSECTION.

“ UPON removing the scull-cap, the sinuses and arteries of the dura mater seemed to be unusually turgid with blood : when the dura mater was cut and turned aside, those of the brain were found to be extremely turgid with blood : over the *right* hemisphere of the brain, there was an effusion of coagulable lymph ; on the *left side* the effusion was merely of serum ; the ventricles were much distended with water : the same effusions of serum, and coagulable lymph were found upon the lower surface also of the brain, and there the dura mater was manifestly inflamed. The cribriform plate of the ethmoid bone was gone, being entirely destroyed by caries. The bones of the right side of the nose seemed all loose and carious ; but all below the ethmoid bone within the nose, was an indistinct mass of putrid and mucous flesh and bone.”

Having thus set before you many lessons, and some examples, and proved what I have described, by true drawings, and illustrated the operations I recommend to you by plans ; I leave you to your own discretion, sense, and judgment, reminding you only, that this like every tumour, should be resisted at an early period of its growth : that these are not maladies to be cured by gentle and trivial practices.

## DISCOURSE XXV.

*On Tumours of the Gums, Lips, Cheeks, and Throat.*

THIS is, in every sense, an arduous subject; especially if it was my design, to reconcile every appearance of disease in those parts, with their complicated and curious structure: parts in perpetual motion, parts performing a variety of functions, as chewing, swallowing, speaking, breathing: parts provided with various glands, salivary, and lymphatic, and secreting even from their surfaces, fluids of various properties. Surely such complicated structure must be a source of various disorders; for always in the animal body, as in less perfect machines of human invention, no part is so formed as to serve various purposes, and to perform many functions perfectly. Reasoning from the complicated and intricate functions and structure of these parts, you would find cause to believe, that their diseases must be very anomalous; observing, on the other hand, the strange tumours, obstructions, and unnatural communications of one part with another, you would be inclined, as every one unacquainted with our science is accustomed indeed to infer, that the complex structure of the parts about the throat and jaws, is the source of much danger and misery.

This confused impression of complex structure, and proportioned danger, was all that struck me when first I entered on my more mature and serious studies; without a hope of ever arriving at any satisfactory knowledge of subjects so slightly mentioned in books. But time and diligence have enabled me to do something for myself, and something for you. If you find in this Discourse no pleasing and delusive speculation, you will, I trust, find many useful precedents, and such accurate dissections, and summary histories of diseases, as will induce you to be studious, and help to make you superiorly useful.

When we can distinctly perceive, that it is from something peculiar in the structure of a part that diseases are frequent and complicated, precedents are very precious; for we are irresistibly inclined to reason on the cause of such organic disease: and it is only under the correction of plain facts and dissections, that we can reason safely.

I must acknowledge, while I can no way explain the fact, that the gums, lips, and inner surface of the cheeks, parts seemingly insensible and indolent, give rise to tumours which are



indeed slow, firm, indolent, and void of pain in their early stages, but in their latter stages, of unparalleled malignity, assuming usually a fungous form ; and, when the firm and indolent tumour thus bursts out into a fungous efflorescence, its growth is so rapid, that I know nothing to equal it, not even the fungus of the brain ! you almost see it grow, and, when extirpated partially, it sprouts up again before the blood of such imprudent incisions is dried up. The tumours of the gums are spongy, luxuriant, hæmorrhagic, and truly cancerous : those lodged within the substance of the cheek, knotty, indolent, slow, malignant, and, however long they are of showing their malignant nature, they terminate, if neglected ; (and much it is to be lamented, that, from the patient's fears, and the surgeon's timidity, they often are so,) in the most incurable and desperate maladies.

The gums are subject to such an infinite variety of slighter swellings, to boils, to little indolent tumours resembling the hordeoli, or tumours of the eye-lid, and to harmless indurations, that those which are the germs of the most horrible diseases, are too little suspicious, too slightly characterised by any peculiarity of form or aspect to attract attention, till too late.—A small, firm, seed-like tumour is perceived, but hardly noticed, for months ; it is seated between two of the fore teeth, begins to separate, displace and loosen them ; it grows imperceptibly and slowly : the teeth are raised from their sockets ; they become loose and vaccillating ; they have no longer any hold of the jaw, but are merely hanging in the tumour ; the tumour retains its original gristly hardness at its basis, becomes rugged and irregular in its upper part, with a cock's-comb-like edge : though little painful, it bleeds from time to time ; it extends itself to the gums of other teeth, which are successively displaced from their sockets and loosened, and one side of the mouth is occupied with it. Next the hard basis of the tumour extends into the cheek ; the tongue begins to be pushed aside, horrible fætor of the mouth ensues, with frequent hæmorrhages ; the tumour now protrudes and keeps the mouth open ; the disease becomes now terrible and painful, the patient survives for a few weeks, with the mouth and lower part of the face wrapped up in handkerchiefs, in a miserable and loathsome condition ; the putrid and blackened blood distilling with the acrid saliva through the filthy clothes, till wasted by suffering he dies in inexpressible pain. Such is the kind of death, from which, I sincerely believe I have saved many by a slight incision.

“ A young Gentleman, Mr. H——, about 25 years of age, of an athletic form and healthy constitution, and without the slightest taint of disease, hereditary or acquired, had, from no

perceptible cause, a tumour firm, cartilaginous, and elastic, seated so fairly in the centre of the gums, as to raise the two centre teeth of the lower jaw from their sockets far above the general range of the teeth, and separate the two that lay adjacent. Gradually, but yet in a short period, in a little more than three months, it had separated those two central teeth, projected from betwixt them, and increased to a very remarkable size; and, though it had begun from the inside gum, the greater portion seemed to be before the gum, just over the chin, projecting the nether lip.

“ This tumour was about the size of a walnut, irregularly globular, *knobby*, and shining; when moved by pressing it with the thumbs, backwards and forwards, it seemed firm, fixed, and actually a tumour of the jaw-bone; yet I knew it by its smooth rounded form and its elasticity to be a tumour of the gum. It felt, when pressed between the finger and thumb, so elastic, that a tyro must have believed it to contain a fluid, while I knew it to be in truth a solid tumour, neither suppurated, nor capable of suppuration. Its general aspect was that of a tumour so indolent, that nothing need be dreaded from it, and so much had it the form of one that might contain matter, that an unskilful surgeon might have been induced to strike his lancet into it; but I was well aware, that not a drop of matter would follow any puncture made into it, that the tumour inflaming, would turn out its edges, spread into a fungus, and, in a few months, cause a horrible and melancholy death.

“ Dr. Munro, Mr. Allen, and myself, having consulted on the nature of this tumour; judging by the analogy of former cases, declared it to be of a most dangerous nature; it had already displaced the teeth, probably injured the alveolar process of the jaw-bone, attained to an alarming size, and threatened, in no long period of time, to assume the most malignant possible form: we explained to our patient, that it contained no matter, was incapable of suppuration, was of a size that forbid all hopes of resolution, was sure to become cancerous, admitted of no delay, and we explained, that we dared not, even in its first and least alarming stage, do less than extirpate it from the very root: we represented, the operation was harsh but not tedious, void of danger, even of hæmorrhagy. That nothing was to be feared but the not cutting it completely out.

“ In preparing for such an operation, it is right to have ready the apparatus of a dentist, especially forceps to twist out the teeth, strong pincers to cut the solid gums, engravers' knives to cut away whatever is corrupted of the jaw-bone, and pieces of dry and solid sponge, to thrust down into the void left by extirpating the tumour, in order to prevent hæmorrhagy; and

two things the surgeon must be prepared to encounter, great difficulty in cutting the tumour, and such confusion from the mouth filling, like a cup, with blood, that, after the first stroke, he can see nothing of what he does, but must proceed by feeling. The surgeon has much reason to fear that, in an operation where his view of the incisions is so obscured, he will be guilty of much unseemly mangling and tearing; yet the pain of such an operation, however rudely performed, is nothing to be compared with that of pulling out a rotten stump, and the motives infinitely more persuasive than a toothach.

“ In performing this operation, I held the jaw-bone firm with the fingers and thumb of my left hand, while my assistant inverted the lower lip, and, with a scalpel of special strength, broad-backed like a cartilage knife, I made the incision in such a form as to resemble the letter V, or the Greek delta. The knife was carried by the side of each of the displaced teeth; all my strength of hand was requisite to carry the knife down to the angle; blood instantly filled the mouth, so that, after the first stroke of the knife, every thing was done by feeling; but I cut with such decision, with such level lines, and made them so fairly meet each other in the angle, that, by pressing my two thumbs, one within side of the tumour, the other without, and pushing alternately with my thumbs, and poising with the flat handle of the scalpel, I pushed the tumour out, clean and unmangled, leaving a very wide opening bounded by the fangs of the adjacent teeth; and, after allowing the part to bleed till it stopped, I laid a piece of sponge in the deep triangular cleft made by the operation, and closing the upper range of teeth upon the sponge, their pressure kept it in its place. This sponge was removed the second day; simple dressings of dry lint rolled in the shape of a pellet was substituted for the sponge; during eight or ten days our patient ate cautiously, and, in little more than ten days, the incision was completely healed.

“ I was greatly interested in knowing the internal state of the tumour in this stage; for I regarded this small tumour as the germ of that terrible disease, which I knew so well by experience, for which I had operated sometimes successfully, sometimes at so late a period as only to witness, perhaps to accelerate, its fatal catastrophe. There had, upon making the incision by the side of one of the teeth, appeared a little matter, but so very little as hardly to be perceptible in the time of a bloody incision, and not at all to diminish the size of the tumour; but whether there was any fluid, purulent or gelatinous in the centre was still doubtful. In the central parts were small cavities, and, when they were cut vertically, a gelatinous substance



oozed out. The internal surfaces were studded with small grains like millet seed: the thickness and cartilaginous texture of the coat of this tumour formed by the gums, shews that the matter would have been long in making its way through them; its gelatinous nature proves that the cavity would not have closed; the irregular surface studded with small grains of a glandular nature, explains to us how such a tumour, after bursting, turns inside out, and degenerates into a granulated mass of fungus, sprouting in berry-like knobs, and little masses of vascular granulation. Whatever cavity there is in a tumour of this solid consistence, seems to me like a calix ready to burst, and turn out its inner surface, with a new and luxuriant growth of fungus. The dissection of such a tumour, having fleshy walls and granulated internal surfaces, always reminds me of the imprudence of partial incisions, in consequence of which a part of the walls of the tumour being left, the worst part of the disease is left: a fungus sprouting up from the bottom of the wound, is the first intimation of the disease being imperfectly extirpated, a rapid growth, hæmorrhagy, pain, and, in one word, cancer ensues: and these are as invariably the consequences of striking a lancet into such a tumour, as of imperfect and ill-concerted operations.

“ This gentleman is perfectly cured, the gums and adjacent teeth firm and sound, and I confess I could not reflect on the structure of this small tumour, without saying within myself, what would have been the state of this tumour in three months? What would have been his condition in six or eight? In its second stage, in little more than three months, it must have filled the mouth with a fetid bleeding fungus! In eight or ten months it must have assumed the perfect character of incurable, loathsome cancer.”

It appears to me that, in many cases which I have been involved in, the disease appeared in a more insidious form, no circumscribed tumour, no formal disease awakening the attention of the patient, preceded the fungus; no suppurated cavity opened, and turned its diseased surface out, in form of fungus; but the mere separation of the gums from the teeth, and alveolar process of the jaw, had the same effect, for this is the description of what I have frequently seen, and it is exemplified in the following case of a young woman who, I fear, never recovered.— In this girl, not more than twenty years of age, the gums of one or more teeth became spongy and rose in jagged points, separating from the teeth: the roots of these diseased parts of the gum became hard and tumid, in proportion as their jagged points became more soft and luxuriant; the disease spread from gum to gum, till it extended along the whole range of

the jaw; the whole substance of the gums became thus spongy, thick, and fleshy, rising into the form of a tumour, of a deep red or liver-colour, with a hard and schirrous basis, a bleeding surface, and cock's-comb-like edges: hæmorrhages burst frequently from the general tumour, while a viscid and extremely fetid matter issued from about the roots of the teeth. This tumour was so vascular, that the teeth, though poised from the sockets, and universally loose and vaccillating, were almost buried in it, and strong bridles of flesh extended across, from that which was external to that which was internal, in regard to the range of teeth, through their interstices. To look into the mouth, you would imagine you saw it occupied totally with a very solid tumour; when you pressed it with the fingers, you found it spongy and soft; when you tried it with the probe, you found it a mere tissue of vessels, through which you could push the blunt point of it in every direction; when you felt for the alveolar process with the probe, you were conscious that the bone was carious. By the general aspect of such a tumour you would be deceived, for you would imagine it, especially in its early stage, to be nothing worse than a spongy intumescence of the gums, which you might successfully clear away with a scalpel, or almost scrape off with a spoon, while it is, in truth, a tumour so malignant, that I have myself performed, and seen others perform, very painful and very unsuccessful operations. It is one of a character so peculiar, that I know nothing but a careful and early extirpation of it that will prevent mischief in its latter stage, nor any thing but a fair, open, and candid prognosis can protect the surgeon from obloquy: be assured, that when far advanced, it is unsubduable by the knife, cauteries, or caustic; I have seen it, after long continued and cruel cauterising, grow for three months, the patient being permitted to retire from this torturing process to the country, only when hopeless and desperate, there to die unobserved.

The case which I am now to relate to you, is one which was confided to my care too late to serve any other end, than as a melancholy example of the consequences of leaving such a disease to run its natural course; a timely operation might have preserved this worthy man in health to his family.

“Mr. Keil, of Monargan, came to town to consult me late in the month of August, 1802, after a regular correspondence with his attending surgeons Dr. Stewart and Mr. Nimmo.—Though past the prime of life, he was a stout and lusty man, healthy, laborious, and active. His whole mouth was filled with a fungous tumour of the worst complexion, wanting no character of cancer, but that it was void of pain; from imperceptible beginnings, and by very slow degrees, it had increased

to such a size as to fill the whole mouth, press the tongue entirely to one side : his speech was embarrassed, and his swallowing difficult and painful, for he could no longer close his mouth correctly, the tumour beginning to protrude. The tumour was of a deep red colour, irregular, and ragged on its surface, luxuriant, and of such rapid growth, that, in a few months, it had attained this horrible form : it projected from his mouth, kept his teeth separate, raised those of the lower jaw from their sockets, so that they (all those at least of the right side of the mouth) stood high above the range of the adjoining teeth, and entirely loose, so loose that they could be picked out with the fingers, and some of them were picked away with the fingers before the incisions were begun. The tumour was void of stinging or lancinating pains, no rude pressure of the fingers excited any but the ordinary sensation ; it was soft, spongy, and bleeding in its extremities, or cock's-comb-like edges, solid and fleshy in its middle parts, and bulging and firm as bone itself where it rose from the jaw-bone : it was neither on account of pain, dangerous hæmorrhagy, nor fetid ulceration, that the patient was now thoroughly alarmed, but by the rapid growth and horrible form of the tumour ; and, from the increasing obstruction in speaking and swallowing, he was conscious that he could not live, and desirous of any operation that might give him even a chance of surviving, for he was satisfied, there being no blood-vessels, nor other dangerous parts in the vicinity of this tumour, that the operation, though painful, could not be dangerous."

#### OPINION ON MR. KEIL'S CASE.

" Mr. Keil cannot have witnessed the doubts and difficulties of his attending surgeons, without being aware of that imminent danger, which it falls to my lot to announce to him : and my duty and conscience equally incline me, to declare it without loss of time, and without reserve. A tumour so unusually rapid in its growth, cannot cease to grow, but must continue to extend the disease by increasing the caries of the jaw-bone, and propagating the morbid action among the surrounding parts : the hardened basis of the fungus will soon spread into the cheek ; abscess, and indurations of the lymphatic glands will ensue, each ulcer will throw out its fungous efflorescence, and the disease will burst out upon the face and angle of the jaw, with all the virulence, and more than the deformity of a real cancer ; this resembles in its form that fatal fungus which sometimes sprouts from the axilla, after amputation of a cancerous breast, or that which still more frequently proceeds from the



spermatic chord, after extirpation of the schirrous testicle, and which no methods, even the most severe and rude in surgery, have ever been known to subdue.

“ I am of opinion that, though not accompanied with pain, nor as yet with much fœtor, nor with profuse bleeding, nor bearing the precise character of cancer, this tumour is equally incurable except by the knife, and sure to prove fatal if neglected, (as I fear it has already been neglected,) too long. When I speak in favour of operation, I must do so with a degree of reserve : I wish I might propose it as a sure resource, but the difficulties, and the chances of success are so equally balanced, that he would, in my mind, be an inconsiderate and presumptuous man, who would, in these circumstances, confidently promise a cure ; but he would, on the other hand, be inhuman and selfish in the extreme, who, for fear of any reproach that might attach to his own reputation, would refuse our patient the only remaining chance of life and health. The terrible stage of ulceration, protrusion, and hæmorrhagy, and probably of pain, which is soon to ensue ; the loathsome and miserable condition, which is inevitably approaching, would be more grievous to his friends, if, from any want of constancy, we should decline our help ; and they will feel, at some future period, a degree of self-reproach for any present loss of time. But I am beginning to reason on moral feelings and duties, which belong to others, when I am expected, perhaps, to deliver only my opinion on the medical import of the case. I have, in the previous part of this letter, explained the grounds of this opinion, with unaffected deference to the judgment of these professional Gentlemen, who, having seen the beginnings, and watched the progress of this disease, have had time to reflect seriously on its nature and consequences. I advise the operation, and, should this be your opinion also, and the wish of our patient and his friends, shall be ready to perform it,—the best proof I can give of the sincerity of my opinion.”

This Gentleman, conscious of his impending fate, advised by his surgeons, that this was the only chance he had for life, without concealing that it was but a slender chance, gave his consent, and became every moment more anxious that it should be done quickly ; but so critical was his situation, that before the necessary arrangements were completed, a gland at the angle of the jaw had swelled, an abscess there was distinctly perceived, the hard basis of the tumour had run deep into the cheek, and, at this most inauspicious moment, when every hing had assumed the most unfavourable aspect possible, the importunity of the patient, and his friends, became very great,

and I received repeated notes from Mr. Nimmo requesting and urging me to come.

Nothing can be more unpleasant to a surgeon, who has any pretensions to skill, than an operation necessary, mangling, cruel, and savage in appearance, performed within the mouth, beyond the sight of the assistants, and where even the long incisions must be guided by the finger, where the dissection must be irregular, and the whole must be done blindfold, from the blood with which the mouth is filled ; where the best surgeon can hardly say he is sure of what he has done, nor confidently think he has cut away the whole disease. The operation in this case consisted, *first*, in picking away some of the loose teeth which lay in the way of the dissection : *secondly*, in a tedious and painful dissection, by which the tail, as I may express it, or a prolonged and firm part of the tumour, which connected itself with the cheek, was separated from its inner surface, near the angle of the jaw, and dissected down nearly to the chin ; the cheek being reduced in all this extent to extreme thinness : *thirdly*, in a long and direct incision guided by the finger, which separated the firmest part or basis of the tumour, from the whole length of the jaw-bone, from the angle all round past the chin, and nearly to the canine teeth of the left side, where alone the gum remained sound. *Fourthly*, in carrying a like incision, more dangerous by far in point of hæmorrhagy, round the opposite or inner surface of the jaw-bone : *fifthly*, in dissecting away the tumour from the jaw-bone, from the side of the tongue, and from the whole circle of the mouth, a work not accomplished without frequent interruptions from hæmorrhagy, irregular, and which was performed by incisions rude and mangling : and, finally, all the teeth of the right side of the lower jaw were twisted away with the tumour, and the bone scraped clear of all remains of the fungus, down to that decided line of incision, by which the root of the tumour was separated.

I need not say how careful I was to make the extirpation complete ; or how much I risked in dissecting the cheek, so as to leave merely the thickness of the skin, not without a thousand anxieties and fears, lest it should slough off. I left this Gentleman, on the third day, under the care of Dr. Stewart and Mr. Nimmo, and am sure that never were assistants more careful of their patient, nor more sincerely interested in the success of another ; his pastor, Mr. Smith, took upon him, with the most charitable disposition, every little arrangement, nursed him, and watched him. The part exhibited a promising appearance at one period, but a dismal, though not unexpected re-

verse followed, after a few days of retirement in the country, he died in a painful and loathsome condition, with this terrible and fetid fungus, protruding both from the mouth, and through the opening of the gland which had suppurated at the angle of the jaw. Far from being any argument against the early extirpation of tumour, the whole scene struck me as a most melancholy instance of the danger of delay.

Perhaps it is the peculiar structure of the gums, perhaps the proximity of the bone, that gives this malignant complexion to these tumours ; for I have had many occasions of remarking a singular contrast betwixt the malignity of these, and their sudden growth, after an imperfect operation ; and the indolent nature of those of the rectum, though very awkwardly and imperfectly extirpated. Sometimes, though rarely, I have found long tumours, like polypi, depending from the walls of the rectum, protruding every time the patient went to stool : and creating inconceivable irksomeness and unnatural pain. Very often I find the folds of the integuments, where they are gathered and plaited at the opening of the gut, and the glands with which the rectum is surrounded, growing into ragged tumours ; sometimes of a prodigious size, fungous and loose in their texture, swelling like a turkey's gills, when the patient strained at stool, usually concealed within the rectum, but sometimes protruding partially. But these tumours, formidable as the annexed sketches express them, I have always found of a mild character, void of pain, attended only with irritation and a sense of gravitation ; but never ulcerated, seldom hæmorrhagic, and bearing to be treated by every rough method, to be tied with ligatures, or extirpated with the knife, or destroyed by caustic, without returning.

The history of such a disease has so little interesting, so little variety of circumstances, that even in the case of a friend, for whom I had a particular regard, I found, after many an anxious conversation, nothing to mark but what I have found in every case, viz. a tumour slowly forming, indistinctly perceived at first, long conceived to be merely an irritation, unwillingly recognized as a tumour, growing very slowly to that size which requires operation ; protruding at each time of going to stool ; but easily repressed with the finger, like a mere prolapsus of the rectum, and occasioning, through many years, in which the patient was sensible of its existence, no worse symptom than irritation, and a sense of gravitation.

“ M. D. a young gentleman of about twenty-five years of age, had, if not from infancy, at least from the earliest of his recollection, a tumour in the rectum, which, every time he went to stool descended, so as to leave a long continued tenes-



mus, with irksome squeezings of the sphincter, and frequent squirts of urine : but it was easily repressed with the fingers, after which the strainings ceased. The tumour was not painful, but hæmorrhages frequently burst from it, though never to a great excess : it was manifestly of great length. The head or bulky and dependent part of the tumour is extremely firm, and bolts out before the fæces at each time of going to stool ; the stalk or pedicle, is four inches long, not that its origin is that far from the opening of the rectum ; for the neck is lax and fleshy, and lies, after being pushed back within the gut, in somewhat of a coiled or convoluted form : when the finger, being passed into the rectum, is laid along the tumour, a large nutritious artery is felt, distinctly running the whole length of the tumour, and beating along the whole length of the finger, just as the artery of the testicle is felt running along the spermatic chord ; a circumstance, which makes it, if not necessary, at least desirable, to kill the tumour, by a ligature applied at its root, and close as may be to the walls of the rectum.

“ I know no disappointment so provoking, no sense of awkwardness so irritating, as that of miscarrying in an operation seemingly so simple as this : yet I confess my sense of awkwardness, and want of adroitness, was very unpleasant to me. I confidently expected to apply a noose, with Levret’s tube, or what is equivalent, the eyed-probe which I sometimes use in tying a polypus ; and it is my duty to make this confession to you, that I endeavoured in vain to apply the ligature, by this simple operation, to the root of the polypus, and kept my young friend long under an irritating operation, in a painful posture. But on these occasions, I have by me wires, probes, and eyed-needles of all shapes : I abandoned the intention of slipping the noose thus over the pedicle of the tumour : I threaded a long-eyed needle, mounted on a stalk, with a ligature of waxed thread ; I passed into the rectum a lithotomy conductor, or blunt gorget, filled with cork in its concavity, and introducing the needle, and striking it through the root of the tumour, very close to the walls of the rectum, I with a common hook, run along the face of the cork, picked out the ligature from the eye of the hook, (a hook like that is used in aneurism of the thigh or ham,) drew it down, and brought it out by the anus, and turning it over the knob, or bulky lower part of the tumour, retracted it so as to make the loop strangle the tumour, which dropt off in a few days.”

But watery and yet very bulky and protuberant tumours, encircling the whole verge of the anus, corresponding in their form, viz. three, four, or five tubercles, with the great lurks or folds in skin, are infinitely more frequent than tumours with-

in the gut. Those tumours of the verge of the anus, though bearing the most formidable aspect, rarely degenerate into cancer of the rectum, except in extreme old age, and when irritated, neglected, or disregarded. But if any thing can incline the disease to cancer, or make it alarming, it is the imperfect extirpation of it, or an ungainly attempt to kill it with ligature. Among other varieties of this tumour, the following instance is one which, after being imperfectly extirpated, grew again in a few months to twice its original size ; after this second growth, the surgeon, more anxious and more timid from his ill success, applied ligatures, by which, far from having strangled or killed, he irritated and inflamed them : they had suddenly increased in size, and he was not a little alarmed, and doubtful whether to draw the ligatures firmer, or to extirpate the whole with the knife. The subject was a very hale and vigorous young man, in the prime of life ; though the basis of the tumour was very hard, and the tumours themselves towered to a great height, I found all the verge of the anus, down to the very circle from whence they arose, soft, limber, and natural, as if no such disease were even in its vicinity. With three or four strokes of the bistoury I extirpated the whole, and cleared the verge of the anus entirely of disease, or the seeds of it, so that the young man continues now in perfect health ; but to do this, I spared nothing ; I pulled each tumour out with all the strength of my finger and thumb, and cut out along with it that part of the verge of the anus that belonged to it, muscular as well as cutaneous : to whatever depth the hardness extended I cut, introducing the bistoury quite within the circle of the anus. Conscious that if the operation should prove again unsuccessful, the lad could not escape a miserable death, I cut away the whole circle of the anus, and have so often cut away the whole, or much of the circle, without the slightest ill consequence, that I cannot but admire the story related in Keill's Anatomy, which, when I was a boy struck me with so much horror ; where, in speaking of the verge of the anus, the case is related of one, who having the whole circle of the anus extirpated for piles, I believe, had the anus so constricted, that he could never after pass hardened fæces, nor go to stool without a glyster.

Wherever it becomes necessary to extirpate the whole circle of the anus, I have found it safe : the necessity of the case would vindicate us ; but experience of the little inconvenience it produces entirely reconciles us. In another case a tumour of prodigious volume, rolled out lump after lump, every time the patient chose to squeeze it down, and still left great rolls within the rectum, which could be hooked out with the fingers, as you would hook out a poney's tongue from its mouth, when

preparing to give it a drench. From such a voluminous tumour, you may imagine the distress this poor creature suffered. He was by natural growth, a big, strong, and clownish fellow : by continual feeling of sickness and disease, he was become sallow, and meagre ; and by frequent, I may say incessant, diarrhœa, he was greatly reduced in strength. The sense of pressure was inseparable from this enormous tumour, whether reduced or protuberant ; and this tenesmus and straining so incessant, that twenty times in a day, a pressure, which he could not restrain, pushed it out ; you may easily imagine, what unceasing feelings he must have suffered, when so voluminous a tumour was repressed within the gut.

Yet the character of the tumour was singular, in being attended with not the slightest pain, not a speck of ulceration, and little hæmorrhagy ; it was soft, woolly, lubricous, and of a shining red like velvet, and as smooth, except in its extreme edges, which were toothed, and scalloped, like a cock's comb. The whole mass of tumour might measure about thirty inches in circumference ; it belonged to the circle of the verge of the anus in such a manner, that that circle was the root of the disease, and the tumour could not be extirpated without the whole circle being cut out : and it was so compressible, that when you thrust the fore and mid fingers through the centre of the mass, into the rectum, your knuckles, and almost your hand, were buried in the tumour ; the tumour receding on each side, and allowing you to penetrate as deep with your fingers, as if there had been no such disease, and you had the consolation to feel from within, that the verge of the anus, a very little way within the circle, was entirely free. This tumour, by far the largest of the kind I have ever seen, was extirpated by ligatures, driven through the verge of the rectum, with a common embowelling needle, passing it alternately from within outwards, and trying each stitch, or round, as firmly as the biggest waxed ligature could bear to be drawn. The whole operation was completed at once ; the whole of the tumour faded and died at once ; the patient was entirely and perfectly delivered of his disease ; and the circle of the anus was entirely extirpated, the patient never complained, nor even suspected the slightest inconvenience.

You remember that I do not profess to follow any perfect order ; yet, if I did, I know none more natural than to arrange with tumours of the gums those of the cheek ; or to compare the diseases of adjacent parts, especially where their constitution, form, surface, and internal texture, their glands, exhalents, and other apparatus of secretion, in short, their entire structure is similar ; and where by a very allowable inference, their diseases may be expected to be allied. So it is, I believe.



with the cheeks and the gums, where the schirrous indurations of the early, and the cancerous excrescences and fungi of the latter stages, are so extremely similar, and where there are but a few special differences, which are easily described.

The cheek is a part where no conspicuous gland, (the parotid and the socia parotidis excepted,) are known to exist; and yet the tumours I am now to describe, are plainly not diseases of cellular substance, nor of the secreting surface, but assume very early, and always before they arrive at ulceration, a knobulated and glandular form; where, the first knot or kernel is plainly glandular, and where the tumour, when it becomes irregular, and threatens cancer, plainly is so, being irregular, by the spreading of the disease from gland to gland. I know no disease which I stand more in awe of, and chiefly I fear it from these considerations, that it is rarely mild or stationary, almost always progressive towards something more alarming; and either the tumour is seated so much in the centre of the cheek, and so adheres to the inside membrane, as to make it difficult to extirpate it, for fear of making a large opening there; or by being seated further back, is so entangled with important vessels and nerves, as to make the extirpation a matter too critical to be attempted lightly. This is a disease of the most insidious nature, so slow in its growth that we are, from its long duration, diverted from any sense of danger; I have known it exist for twenty years, and even from infancy, without assuming a threatening aspect; when all at once, without any sensible cause, it has shown its malignant nature. While you are encouraging your friend or patient with hopes, that the tumour, which he cannot but think of at times with apprehension, is mild in its nature, it grows suddenly hard, reddens, ulcerates, and becomes cancerous. Or when you have extirpated the tumour, and dismissed your patient, confident in his sound condition, and self-contented in respect to what you have done, when you have long forgotten the operation, and the patient, and can hardly prevail with yourself to believe that a disease so extirpated can return, letters come, announcing to you that it has grown again. Various inexpressible circumstances, of consistence, colour, and form, intimate to the surgeon the lurking danger. The tumours which I most dread, are those seated in the centre of the cheek, deep within its substance, connected at once with the inside membrane, and with the skin, not moveable, firm, glandular, hard in their general substance, and irregular in their form, knobulated, and having, as a sort of centre, some one or more globular masses, also very firm, but which, in place of being hard, have a sort of elasticity which gives the conception of their having cartilaginous walls of extreme thick-

ness, containing a small proportion of gelatinous matter. And in truth it is so ; these central globes are found usually to contain a gelatinous fluid : but sometimes, nay frequently, a thick and gelatinous blood, partly clotted, partly fluid. Such a tumour is extremely slow in its growth, but is still growing ; little painful, but yet communicating a general sense of tooth-achy pain, or shooting ; sensibly aggravated in moist weather, or east winds ; and it is usually covered with a coarse and granulated skin, very thick and porous, like that of a lemon, firmly attached, in a considerable extent, to the surface of the tumour, and incorporated, as it were, with the substance of it ; this adhesion of the skin is ever a sign of danger.

Of such tumours, I shall lay before you various examples, not uninteresting, with operations sometimes fortunate, sometimes unsuccessful : nor shall I be so unmanly as to conceal from you the cases in which I have been unfortunate, especially where the ill success may be imputed to any want of skill or conduct, for every such avowal must be invaluable to you.—No man can be always wise, nor always fortunate ; he who pretends to unvaried success, is either a knave or a fool. I take especially pleasure in laying before you a case where this species of tumour was strongly characterized ; where it existed perhaps from birth, certainly from early childhood ; where the operations were such as I could not enter upon without reluctance, nor perform without encountering various difficulties.—In the first, I fear, a slight fault on my part proved the occasion of great pain, and danger to my patient, of a weary journey, and a second operation ; the recollection of which, though painful to me, may be useful to you ; and this I feel to be the surest way of restoring myself to placid and approving thoughts.

“ Mr. Taylor, a tall and slender, but strong and active man, not exceeding thirty years of age, was afflicted with a tumour, which had indeed existed from his earliest years, but had increased lately with alarming rapidity ; assuming, at the same time, so malignant an aspect, that all those whom he consulted declared it dangerous, wished that it might be extirpated, but declined performing an operation attended with so many difficulties. In this disturbed and agitated state of mind, he travelled from a remote part of Ireland to commit himself to my care. The indolence of this tumour from childhood upwards, its sudden increase of growth, from imprudent and violent exertions, its hard irregular form, the coarse and porous skin with which it was covered, the firmness with which it adhered to either surface, viz. to the skin of the cheek, and to the membrane of the mouth ; the redness it contracted, and the shooting

pains which began, towards the latter stage of the disease ; the manner also in which it was consolidated into one substance with the whole cheek, and the apparent impossibility of extirpating it without cutting actually the cheek itself away, were circumstances particularly worthy of attention. This tumour, he was well assured, had existed, if not from his birth, at least from his early infancy, in the form of a small, firm, *kernelly* tubercle, seated within the substance of the cheek, not far from the angle of the nose ; nor can he recollect, during all the period of his youth, or manhood, any circumstance, either of pain, swelling, or change of colour, which called his attention to this tumour, much less alarmed him. He had arrived at his thirtieth year, when suddenly, in consequence, of violent exercise, in very sultry weather, and in the open air, he observed, first, slight and transitory pains in the tumour ; but such as never would have alarmed him, had he not been wakened from this supine and unreflecting state of mind, by a manifest and sudden increase of size. Then he thought of rubbing the part with mercurial ointment, and applied to his brother, who is of our profession, for his advice. Then, for the first time, he began to feel all the unhappiness of a man in danger of cancer, and doubtful whether even the severest operation could afford him relief ; and with all the agitation of one occupied with such dismal reflections, he consulted every one who was accessible to him, and still as he passed through the country sought new counsel, and every where he had the unhappiness to find, that his disease was regarded as desperate, and the operation as barely practicable.

“ Six months had now elapsed, from the time of this conspicuous increase of size ; the tumour had attained to more than twice its original bulk ; there had been an accretion of many lesser lumps to the main body of the tumour ; in little more indeed than three weeks, the tumour had increased to four times its original size, the pains were become more pointed and frequent, he was obliged to be careful of it, and preserve it like a part affected with tooth-ach or rheumatism, from cold, and the vicissitudes of the air ; and in damp weather or severe cold, he was tortured with pungent heat and shooting pains, the heat and shooting pains being peculiarly felt in that part of the tumour which was most conspicuously increasing in size.

“ But if those shooting pains, and this sudden increase of size were ominous, the change which next ensued was more perplexing, and alarming ; for on its internal surface, it began to connect itself not only with the inside surface of the cheek, but with the substance of the gums : an irregular excrescence



projected into his mouth, which he compared with a claw or horn, and of such length and bulk, that, being checked by the teeth during sleep, it was torn away with a considerable effusion of black and fetid blood. On the external surface of the cheek, the skin thickened, became porous and coarse, adhered to almost the whole extent of the tumour, was puckered and pursed up, at the place where the lesser glandular lumps were grouped and knotted round the chief body of the tumour, which was very nearly in the centre of the cheek.

“ Alarmed by such decisive changes in the character of the tumour, he called upon a Dr. Henry, who had promised to perform the operation, but he now expressed his reluctance on account of certain blood-vessels, especially of the infra-orbital nerve and artery, which he feared would retire into their hole under the cheek bone, before the artery could be secured. This discouraging suggestion, and an express declaration that the tumour was of a schirrous nature, induced Mr. Taylor to apply to a number of gentlemen who told him of the danger of the disease, of the difficulty of the operation, and the prudence of coming directly to this city.

“ My patient was of a pale complexion and melancholy temperament, and, after a journey so cheerless and inauspicious, where he was told at every step the danger of this disease, and the difficulty of that operation from which alone he could expect relief, he was too unhappy and dejected to receive any consolation from my assurances. The tumour was not of that size to be esteemed monstrous in any glandular or fleshy part, but it was great in proportion to the part in which it was seated, it was of a stony hardness, firmly connected with the substance of the cheek, of a globular form, and surrounded by small subsidiary tumours, seemingly of a glandular nature, firmly condensed and mixed in their substance with the main tumour and with the substance of the cheek. The skin was thick, with gaping pores, a coarse granulated texture, and a very firm adhesion to all the tumour, except its very apex ; and, in the centre of this granulated skin were livid tubercles, about the size of a boy's marble, extremely hard in their substance, and of a very ominous appearance ; and where these projected a little below the centre of the cheek, the skin was puckered and drawn in.— While the external surface was thus connected with the skin of the cheek, so as to draw the angle of the mouth obliquely upwards, the internal surface was very dangerously attached, not only to the inner surface of the cheek, but to the gums: the inner surface of the cheek felt, upon introducing the finger, tuberculous, and rugged, and extremely hard ; and the tumours, when felt from within, appeared distinctly to be the same indu-

rated schirrous substance which projected from the external substance. Upon inverting the cheek, these tubercles were seen knotty, irregular, and rugged like piles, or like those venereal warts of the anus, which are termed *fici*. Where this diseased substance approached the angle of the nose, it adhered very firmly to similar tubercles springing from the gums, and the shooting pains, now severe and constant, together with the dejected appearance, and sallow complexion of Mr. Taylor, joined to the united opinion of many of our profession, could not fail to impress me with a confirmed apprehension of its malignity ; but that only inspired me with a greater desire to give him the only chance of life.

“ In respect to the projected operation, no circumstances could be more discouraging than those I have just described : I was conscious that, in attempting to save him, I must not merely extirpate a tumour by nice dissection, but cut through the cheek and dissect away almost all its substance ; that I must divide the facial artery below, and the transversalis faciei coming from the temple, and the labial artery returning from the lip ; that I must not merely wound, but cut away the salivary duct, and lay the whole side of the face open, making a breach larger than the mouth : it could not but seem problematical, whether, after such an operation, the saliva, or food, could ever be retained again, whether the attempt would not involve me in disgrace, whether I should not be blamed deeply for adventuring on that operation which so many had declined. But I was emboldened by this recollection, that, often by a grape-shot, or by a splinter in battle at sea, the whole cheek is carried away, and sloughing succeeds to immediate loss of substance ; that I had every reason to believe, though much of the substance of the cheek must be cut away, I should be able to bring together the remaining skin of the cheek ; I most of all considered that this gentleman had travelled from a distant country, and, leaving behind many skilful and dexterous surgeons, came to commit himself with resignation and confidence into my hands, that I owed him some sacrifices in return, and that, unless I attempted to save him, he must, at no remote period, die of cancer ; I, therefore, prepared myself for the operation.”

The hooks, knives, and forceps necessary for such a dissection being properly disposed, with needles for tying the arteries, I proceeded with an operation which could not fail to be extremely slow, since its principal purpose was to dissect out the whole disease, and save as much as possible the sound parts.

I drew my knife in the direction of that line of feature which

marks the levator anguli oris, and surrounded the tumour with a second incision like the first; but, approaching very closely the angle of the mouth, I proceeded to dissect away the tumour from it, and from the jaw-bone, and thought it singular, that the labial artery where it approaches the lip, and the facial artery where it turns over the angle of the jaw, were so elongated without being divided, that I slipped a ligature under each of them with the needle, without pricking even the cellular substance, and tied them before cutting them across.

Having turned the tumour upwards, I cut through the inside membrane of the mouth, cut clean away the tuberculous prominences of the gum, dissected upwards towards the eye; and, when much of the tumour was detached, regarding the infra-orbital nerve as the most important and painful part of the dissection, I reserved this as the last stroke, and, while I dissected this part, and especially when I cut the nerve across, he suffered an intensity of pain which made him quite savage, it was then only that he stamped with his feet and cried out in agony.\*

\* I have always observed that the cutting across a nerve produces an inconceivable shock, and of this nerve especially a dreadful pain, which is on no occasion so manifest, as when the operation of cutting across the nerve for the cure of the tic douloureux is performed; for then the cutting across the nerve is complicated with no other incisions to confound the sensation, which is at once so peculiar, and so alarming, that the patient feels as if shot, and starts up in agony inexpressible; and this first sensation is instantly followed by a pleasing calm, and a happy and perfect relief from pain. Those whom I have seen labouring under this singular nervous disease, have had the affected side of the face reddened, the cheek convulsed, the lip quivering, and the eyes filled with tears from the intensity of pain. One old man, about 70 years of age, who was cured in an instant of a disease of many years duration, by my worthy and much respected friend, Mr. Harriſon, of Ulverston, had this convulsion, and trembling of every feature, in a singular degree. Another old gentleman, Capt. G. of R——, in Ivernesshire, had this incessant trembling of every feature, as if each muscular fibre of the face had been struggling in an indetermined condition, betwixt convulsion and paralysis; and this convulsion was accompanied with such agonizing pains, and wild and piercing cries, as actually alarmed the street in which he lived: but I shall describe his condition in his own words, as dictated to my assistant Mr. Allan: Capt. G. was, at the period of the operation, about 75 years of age.

“One afternoon, about eleven years ago, while sitting at dinner, I was suddenly and severely attacked with sharp and thrilling pains, beginning at the root of the wing of the nose, extending all over the right side of the face, centering in the cheek, but shooting in a particular manner upwards by the corner of the eye into the temple: the fit was momentary, but the cheek, the lips, and eye-lids quivered, and were convulsed.

“From this time I have been always subject to this torturing disease, which has been the occasion of various journeys to town, and innumerable consultations: my sufferings sometimes intermitted for weeks, during which I was almost entirely free from pain; and often again I suffered six or seven severe paroxysms of convulsion and pain, in one day, and as many during the night: I was for two years contented with the advice of my surgeons in the country, who prescribed blisters, and many other applications both severe and trivial, but with so little good effect, that they ascribed my disorder to worms in the cavity of the upper jaw. About two years after the first attack, my disease assumed a more determined form, and



It was removed, and before the next step of the operation, the gap seemed horrible, even to me. The side of the face was

returned in paroxysms with a degree of regularity: after a lapse of two or three months, it would return for an equal period, and continue to torture me, so that my appetite and sleep left me, my memory even seemed affected, and my general health suffered.

"About four years ago I came to Edinburgh, and put myself under the care of a surgeon of distinguished reputation, consulting, at the same time, Dr. Gregory Grant; and, by their conjoined advice, I had the gums of my upper jaw scarified, and three or four of my grinders extracted; and, after remaining some weeks under their care, I returned home seemingly well, and felt nothing of my disease till about the third month, after the scarifying, and the extraction of my teeth, when suddenly it returned in all its violence, and continued to distract me for two years more.

"At the end of two years I was again driven to town by this distracting malady, and, having put myself under the care of the same gentleman, and, having called Dr. Monro into consultation, he directed that the only remaining grinder on that side of the upper jaw should be pulled, and I was then sent home, but without the slightest alleviation of my disorder, which I endured for two years longer.

"About three weeks ago I arrived in town a third time, and, after a very formal and numerous consultation, it was resolved, to try the experiment of cutting across that nerve which passes under the eye to the face: my agonies were now so dreadful, and unremitting, that, often I was obliged to start up from table, and could not refrain from cries and howling, such as were but too distinctly heard in the streets. The operation was accordingly performed by one of those gentlemen, who made the incision you see beneath the eye: for some time I flattered myself I had derived all the benefit that was promised me, and even when my pains returned, I was over-persuaded that those were the slight remains of a desperate disease, and would be transient. In this persuasion I had, I may say, begun my journey; I had got into the post-chaise which was to convey me from town, when I was seized with a paroxysm so agonizing, so very dreadful, that I was carried back into the inn, and have now resumed my place in lodgings, to commit myself to your care.

"April, 1804."

I doubt not the reason of the *tic douloureux* returning, is often like the ill success of vaccine inoculation, to be ascribed to the manner in which the operation is performed.\* The performing of this nice and delicate stroke of the knife was probably confided, in this case, to a gentleman whose first and only dissection of nerves had been in the *living subject*; his ill success was sufficient warrant for this conclusion; it was impossible for an anatomist to look at the fear of his incision, without an instant conviction, that it did not at all cross the course of the infra-orbitary nerve; deceived by the baggy eye of a man advanced in years, and feeling only for the margin of the socket, he had carried a long incision in the direction of the natural lurk of the skin, and certainly could touch only the rim of the socket; it is far below this, that the nerve lies in a deep hollow: my education, and my experience, put me, I believe, far above the puerile triviality, and, I hope, above the suspicion of magnifying beyond the truth, this trinity success; I could not but know the infra-orbitary nerve a little better than my predecessor, and could not fail to cut it. I seated my patient in a chair, and, pressing the point of my fore finger deep into the hollow where the nerve lies, cut it across, by striking in a small sharp-pointed knife, making no length of outward incision, and, hooking the point of the crooked bistoury behind the nerve: in the very instant of the stroke by which it was divided, Capt. G—— started from his seat, ran forwards in great confusion, exclaiming, "Good God! what's

\* The *tic douloureux* has returned after the operation has been performed by the first surgeons both in France and England. It has sometimes been cured by the conjoined use of calomel and opium. S.

open, the range of teeth in both jaws quite exposed, in spitting out the blood it issued through the cheek, and the tongue, when he turned it that way, passed through the opening, not through the mouth, but through the under opening of the cheek, so that my assistant found it right, to prevent the alarm of the patient, and decent in regard to the spectators, to purse the parts together, and cover them with his hand: in short, it was such an appearance as you would willingly hide from yourself.

But it was a pleasure to see how nicely the parts fell together, when smoothed down with the palm of the hand, and how little they were pursed when sewed. I make it a rule in all my operations, to let even the oozing of blood cease before I lay the parts together; having allowed some time to elapse, I proceeded thus: first, taking the edge of the buccinator muscle, much of which I had saved in the dissection, I raised it towards the cheek-bone, sewed the edge of the muscle, to the rags of the inside membrane of the mouth, and to the strong cellular and muscular substance, under the most prominent part of the cheek-bone, and carrying the thread inwards and tying it on the inside of the mouth, I there cut it quite short, resolving never to look after it, but leave it to suppurate out. Next, I passed a deep stitch through the upper part of the incision, where force was required to bring the parts in contact or to hold them so there; in the hollow, I meant to lay a soft and large compress. But the lower and central parts of the incision, where the flaps of skin were more easily approximated, I joined, by passing three delicate sewing needles, as hare-lip pins, through several points of the wound: the intermediate points I drew nicely together with plasters; I was careful to use the least possible force; to make no strain by the sutures; to lay my compresses light and soft in the hollows; and to roll my bandage round the jaws very equally, and gently, for the teguments were most alarmingly thin, the slightest inflammation would have caused the whole cheek to slough, so as to leave the parts in a dreadful, irremediable condition, with the saliva continually flowing over the cheek, the speech imperfect, probably unintelligible, and the patient would have found no way of being nourished, but by pouring the food down the throat, in place of masticating or

that?" he sat down instantly in perfect composure, free from pain, unconscious of the operation being performed, and expecting it: when questioned about the sensation which made him start up, he said, he felt nothing but as if he had been shot in the head, followed by a momentary confusion, and a total relief from pain. He said he did not imagine the operation done, because the first operation had been a deliberate dissection; he felt now perfectly confident that he was cured, and returned home in two days, since which time, he has lived in perfect health. < happily married, and continues well at this moment.

January, 1807.

swallowing it. Happily the skin adhered in a few days, the needles were withdrawn, in a fortnight he was cured.

But the slightest speck or spot of imperfection in such a work is followed by severe self-reproach. I am not sure that I observed my fault during the operation, but certainly after the cure, I took an alarm, far from groundless. I observed a small glandular-like knob towards the lower part of the cheek, which I ingenuously warned him might be the source of future distress, as the small tumour, indolent during his infancy and youth, had been suddenly the cause of this mischief; I took his promise that he should be observant of it.

This error, so opposite to my experience and conviction, so unlike my general maxims and conduct, I sorely repented. It was at the distance of three years from the period of this operation, that I received a succession of letters from my patient, announcing the return of the disease, and asking permission to come once more to this country, to put himself under my care. The small glandular knob, which I required him to watch, had increased in size, and the gums also had begun again to shoot out small tubercles; that the new swelling, and the return of the disease had begun in this small glandular knot, no bigger than a pea. I remember, only from his conversation, not from his letters: from the complexion of these, one should rather have concluded, that the new growth was only in the gum, beginning in the angle betwixt the gum and cheek, and in the centre of the cheek; a part of the tumour, in the extirpation of which, I surely had not to accuse myself of any fault; and from the slightest and most imperceptible beginnings, viz. a small longitudinal thickening along the scar of the wound, a small pea-like hardening near the lower part of that scar, and a similar hardening betwixt the cheek and gum; it grew with such rapidity, that from week to week its increase was manifest, and in less than two years, it had attained fully its original size; accompanied with pains, more distinctly lancinating, more poignant, and frequent, than in its first stage. Again he travelled from Tyrone to this city, and after many perplexities and fears, submitted again to the operation. I, on my part, had no slight motives for anxiety, for now actually the whole cheek, the skin excepted, was to be cut away; the buccinator muscle, and the living membrane of the mouth, were both to be cut out; and I was shocked to think, how possible it was, how far from improbable, that the whole cheek, even from the slightest overstraining of the suture, or the slightest accidental fever, might gangrene and slough, and leave a horrible chasm.

The tumour was almost as large as at first: the great glandular-looking substance, rounder and more uniform; the livid



part of the surface of greater extent, and a stage nearer ulceration, and the scar of the former operation binding the tumour firmly along its whole length; and, except in the very apex of the most bulky and prominent part, where indeed it was more elastic, the whole was of a stony hardness, accompanied with perpetual pain, by which, together with his fatigues, and fears, in this wearisome journey, he was greatly cast down. It now also approached so close to the angle of the mouth, that I saw no way of extirpating the tumour, and leaving more than a quarter of an inch, hardly so much, entire, betwixt the gap made by the extirpation of the tumour and the mouth.

I proceeded to make first, a long incision, bending a little, so as to include all the tumour that was below the cicatrix, and which, in bending round the tumour almost touched the angle of the mouth next, a similar incision bending upwards, in such a direction, as to include the scar of the former operation, the puckered and adhering skin, and a part of the tumour, all that part to which the skin inseparably adhered. Those two incisions included that part of the adhering skin, which required to be extirpated, in the same manner, that we usually include within an oval incision, the nipple of a much indurated mamma. Thirdly, I made a transverse incision, from the temple, i. e. from the tip of the ear over the zygoma, directly across the face, which meeting the first oval incision made two flaps. The tumour I found now more regular in its form than I expected, sacculated, and very dark and bloody; I, after raising the angles of the skin from the cheek and face, and saving all of the skin that I could save, dissected all round the tumour, and reserved those parts of the dissection for the last, in which I had to divide arteries. I then dissected out the tumour from the angle of the mouth, and tied the labial artery; then dissecting down through the lowest part of the incision, into the cavity of the mouth, I tied there the trunk of the facial artery; and finally dissecting out the tumour from under the cheek-bone, and tearing it from the zygoma, a most difficult and painful dissection, I tied a large branch from the transversalis faciei. The veins spouted out blood profusely when cut, but shrunk instantly: the arteries thus successively tied bled none. I never indeed performed so unseemly, and at the same time so bloodless an operation.

Now observe, that in all these points, and to the full extent of the tumour, I was obliged to go fairly through the cheek, and cut every thing completely away, for it was all tumour. The tumour looked formidable when it presented itself, in time of dissection, high above the separated flaps of the skin, and the chasm was horrible when it was cut away; the flaps consist-

ing of skin only, were so thin, that I was in despair when I laid them together; I solemnly declare, that nothing ever astonished me more, than the speedy cure, which was such as must give me courage on all occasions that may in future occur. First, my assistant, Mr. Allan, brought the edges nicely together, and passing a needle through the three points of the incisions, I brought them all together in one star-like centre, exactly in the middle of the cheek. But one ligature, though it approaches two points nicely, cannot go under a third, and bring it into contact with the other two, without turning over and passing from within outwards; in consequence of this awkwardness, for which I was provoked with myself, I had almost balked the great purpose of re-union, and that too at the very centre of all the sutures, and therefore endangering each of them, and of course in the centre of the cheek, so that the whole cheek was endangered: but fortunately the suppuration, in this central point, was very slight: yet, however slight, it grieved me, as it plainly proceeded from my awkwardness. I then took the most delicate sewing needles, mounted on small wooden shafts, like pencil-sticks, and passing two needles from side to side across each long incision, I brought the sides of the three radiated incisions, into the nicest contact imaginable, careful always not to twist my threads round the needles too tight; and I passed one very delicate needle close to the angle of the mouth, to secure that point.

This I do on all occasions, and always very deliberately, and at some distance of time after the operation, and when there is no longer any bleeding to discompose me; and every thing sponged, clean, nice, and dry, I take narrow strips of linen, and dipping them in warm glue, lay them across the incisions, and these being well dried, and hardened, and the needles kept clear of the glue, I can, without risk, on the end of the second day, or on the third, before there can be the slightest risk of suppuration, slip out my needles one by one.

So I did in this case; the less necessary needles I withdrew on the second day; those on which more depended, I left till the third and fourth days; and the needle nearest the centre I left longest. I draw each needle with nice forceps, turning it first a little vertically, that there may be no tugging. I often pass a thread into the eye of the needle, that I may pull quite vertically, and often pass a flat stick betwixt the ends of this thread, and, twisting the ends round the stick, turn the needle vertically, and so loosen it with so true a motion, that there is not the slightest sensible violence, nor the smallest drop of blood: and, before I attempt to move a needle, I take a hair pencil, and, by washing and cleaning the point, and oiling it,

prepare it for passing easily. This method I have long used in all delicate sutures, especially in extirpating small tumours of the face and jaws, and in hare-lips. It was in this manner I re-united, a second time (the operation having been very maladroitly performed upon him when a boy,) the hare-lip of Mr. Whirter, surgeon, of Newcastle, with a scar hardly visible, and with an evenness of lip which enables him to blow the flute very delicately. He was conscious of the necessity of this second operation, and gratified with the success of it.

I have another remark to make to you, that, though a needle is withdrawn, its twisted suture remains upon the surface, caked with blood, and is a security to the wound ; and always, upon withdrawing each needle, I heat the glue-pot again, and, dipping a hair-pencil in it, I wash the remaining ligature, or twisted thread, with glue, so that the needles being removed on the second, third, and fourth days, there are substituted to them various strips of fine linen, with glue, and the pencil being carried over all parts of the incision, the whole is held firmly, yet gently together, by a cake or plaster of glue, which need not once be troubled till you find it safe to wash off the whole at once.

This, compared with the common adhesive plaster of wax, is a nice and cleanly manner of performing those operations in which so much depends upon delicacy, and the nice and curious contact of all the edges ; for any one point left open endangers the whole line of suture ; and this method had, in the present instance, such perfect success, that, in ten days Mr. Taylor began his journey to Ireland perfectly cured, and with less mark of incision, and a more perfect evenness of cheek than at first.\* In an hospital, an unhealthy season, or an unsound constitution, the whole of such incisions must have sloughed off, a dreadful and an irremediable calamity ! but in this healthy and vigorous young man, the parts united most happily.

In operating on this tumour, I was surprised to find a very singular connection betwixt the veins and the central and more conspicuous tubercles, which were indeed firm but elastic sacs, of pure and coagulated blood, inclosed in very thick and solid walls ; and, upon dissecting the tumour after it was laid upon the table, the great tubercle being cut open, and the hard and clotted blood turned out, it was manifest and visible, distinctly

\* The part was not covered with lint or compress for fear of disordering the needles, or concealing any accidental inflammation, but to prevent any ill consequences from the extreme hollowness of cheek, a nice fitted *plumper*, or compress of soft rolled lint, was introduced into the mouth, and the jaws bandaged, to prevent motion during sleep, and he was hardly permitted to lie down in bed for fear of some mischance.



visible, that these cellular cavities had communications with the greater veins.

Many distressing, and some fortunate cases of this nature have been under my care ; tumours of a less malignant nature, and easily extirpated, present themselves daily, and excite no perturbation ; but I would endeavour, by relating less favourable or fortunate cases, to enure you to difficulties, and disappointments.

“ Mr. S——, a venerable old man of 60 years of age, remarkably strong, active, and athletic, for his time of life, had been long subject to a very dangerous swelling of the parotid gland, which now manifestly declined to a state of cancer.—The tumour began early in life, and was extirpated twenty years ago by Mr. Dunlop, a celebrated surgeon in Glasgow : but a gland in which the trunk of the carotid artery is so entirely imbedded, can never be entirely extirpated, thence it has grown again slowly. Mr. Dunlop declining himself to perform the operation, and yet desirous that Mr. S—— should have every possible chance for life, has requested me to receive him under my care.

“ The tumour is divided in the middle by the scar of the former operation ; along that line it is irregularly straightened and bound down ; it rises on each side of the scar, in knobs or apices of a stony hardness, reddened of late on the surface, with a coarse granulated and adhering skin. The whole surface of the tumour is of a dusky red, and its extent very great, for it covers all the flat part of the cheek ; a flattened part rises over the zygoma, towards the temple, to which it adheres very firmly ; one glandular and almost separate lump, lies far forwards upon the cheek, and seems to me a tumour of the socia parotidis, while the rest is a tumour assuredly of the parotid itself.—The tumour is so large as to be flat though bulky ; the most salient point is that which lies immediately *before* the ear, the lap of which is turned back by it ; another branch, I may call it, of the tumour, lies *under* the lap of the ear, and presses it upwards ; the chief mass of the tumour lies upon the cheek, but a very bulky part lies deeply imbedded behind the angle of the lower jaw-bone ; its appearance was unpropitious, for it was of a deep red colour, sensibly inflamed, the inflammation increasing every day, with a deep and stunning pain, while all the basis of the tumour was as hard as stone.

“ Nothing can be more unpropitious than the state of this gland ; first, it is a disease returning long after its growth had been interrupted by amputation : secondly, it is very firm, of a stony hardness, very irregular and *knobby* ; that part which lies out upon the cheek is bound down firm, and flat, by the

fascia, or tendinous membrane that descends from the zygoma; and by the platysma myoides muscle : thirdly, it is growing sensibly and rapidly, and its surface has begun to take a deep and livid colour, while very poignant and torturing pains shoot through the tumour, prevent his sleep, and distract him while awake. This schirrus has every character of approaching cancer, it is most likely too late to attempt the operation, yet what would not one do or suffer to preserve life ? The operation too is full of danger ; this gland cannot be extirpated but by deep incisions, and a very severe and slow dissection ; at the best, it cannot be separated from the angle of the jaw, without cutting the portio dura of the auditory nerve, and paralyzing the cheek ; nor without dividing the temporal, facial, and other arteries : perhaps it may not be possible to extirpate it totally, for fear of wounding the very trunk of the carotid artery, and that operation which is begun with the knife, it may be necessary to finish less perfectly with the ligature. This is the first time I have been obliged to think of such a resource : the latter part of the operation must be performed by poising out the gland from the deep hollow under the zygoma, and behind the angle of the jaw, and then it may be necessary to strangle with the ligature, what assuredly we dare not amputate with the knife.

“ I came to this decided conclusion in my own mind, that, though a case the most unpromising I had ever witnessed, it was my duty, in compliance with Mr. Dunlop’s and his patient’s wishes, and with Dr. Monro’s advice, to perform the operation, difficult as it seemed, and it was plainly such as admitted of no previous plan, but required that I should be guided by circumstances, and my past experience, for I had often [*partially*] extirpated the diseased parotid.

“ I can hardly enter too much into the detail of such an operation, seeing especially that it had an unfavourable issue ; I entered upon it with more than usual composure, with more than I thought natural to the occasion, but, I believe, it was the very difficulty of the case that reconciled me to my task, for I was conscious, in such difficult circumstances, I was entitled to stop, that it was my duty to stop, the moment I approached any dangerous point, that I was no way responsible for extirpating the whole tumour, nor for doing all with the knife. The peculiar complexion of the tumour, for it was now inflamed almost to ulceration, and accompanied with lancinating pains, was unfavourable to our hopes ; its growth, after being once extirpated, confirmed the suspicion of its being of a cancerous nature ; and the parotid has the temporal and maxillary arteries imbedded in it, while the portio dura, or middle nerve of the face, that great nerve which runs across the cheek, and goes to

all the side of the face, passing through it in many branches, so that it absolutely cannot be cut away from its root, which sinks deep behind the branch of the lower jaw-bone, without cutting the carotid artery ; and it cannot be torn away, the firm nerve being entwined with its substance ; even the casting a ligature about the root of the gland is accompanied with excruciating and maddening pain, the nature of which may be imagined from the agony which a tooth-ach or a rheumatic affection of the temple causes. The act of tying a nerve, I am conscious, produces a kind of injury, accompanied with terrible inflammation : this injury is permanent, and the inflammation becomes habitual. It often happens, for example, that the nerves of an amputated stump are so engaged in the cicatrix, that their extremities being superficial, and covered only with a delicate and thin cicatrix, the slightest accident irritates and inflames them ; and I have seen a stump exposed by this to paroxysms of inflammation, in which the stump swelled to the size almost of the patient's body, attended with fever, and such convulsive startings of the stump as usually occur immediately after amputation. The cutting of the *portio dura*, or nerve of the face, occasions the most excruciating pain, as I have already explained in the case of Cap. G——, (vid. foot note to page 490) and I have reason to believe, that the pain proceeding from the truncated extremity of this nerve being unavoidably engaged in the cicatrix after an operation such as this, causes the return of the swelling, revives the disease in whatever remains of the gland, and is the cause of its cancerous nature.

“ My incisions were made in a tripod-like form ; not straight but bending, so as by their prolongation over the cheek, ear, and temple, to make a triangle, in direct lines with three corners, which being dissected away, exposed the convex part of the tumour. By giving these three incisions a circular form in the centre, I left the adhering part of the skin, attached to the most diseased part of the gland, and this centre of *knobular* and stony glandular substance, with thickened and adhering skin, connected firmly by the scar of the former operation, I left untouched, and cut up three flaps of thin and sound skin.

“ After dissecting back the flaps and exposing the surface of the tumour, I dissected away that part of the tumour which approached the mouth, and lay upon the masseter muscle, with which it was so connected that I chose to cut away large pieces of the muscle, hardened and identified with the tumour, leaving the jaw-bone bare near its angle, rather than leave any part of the disease. Next, I turned the tumour down from the ear ; but do not imagine this was accomplished easily, as in ordinary tumours bedded in loose cellular substance ; this tri-



mour was so firmly embraced by the fascia, and adhered so firmly to the zygoma, to the thick fascia which descends from it, and to the tendinous parts of the temporal muscle, that I was cutting through a firm, mixed, cartilaginous substance, and could not distinguish where I had got through the gland, or its adhesions, but by distinguishing that I was cutting muscular flesh, or encountering a naked bone. The third part of the dissection was at once cruel and full of danger ; it was the dissecting away the tumour from the cartilaginous tube of the ear, which was yet done so effectually, as to detach the tumour from the whole length of that tube, down to the temporal bone : but there, a big and firm root seemed so fixed, that I durst go no further with the knife ; I had dissected the tumour backwards from the cheek, and upwards from behind the jaw-bone, and insulated it up to that point where the temporal artery transfixes the gland just before the ear ; there, it will be recollected, the great internal maxillary artery divides from the temporal arteries ; I could go no further, the next stroke of the knife would, in severing the gland from its root, have cut the common root of the maxillary and temporal arteries ; would, in short, have truncated the carotid artery ; what remained of the operation could therefore be done only by ligature.

“ In this dissection I experienced all the difficulties peculiar to a second operation ; for a gland which grows again after being cut, is so bound down to every subjacent part, by the scar of the skin, and by new and strong adhesions, that its connections are of an unusual and cartilaginous firmness : and I had, in this case to encounter the additional danger of a tumour far advanced in its progress towards the last stage of schirrus, and ready to degenerate into cancer ; and it appears to me that that unfavourable change which is marked by shooting pains, consists in inflammation, is accompanied with adhesions, or, to speak more truly, with a consolidation of the diseased gland, with surrounding bones and muscles, just as the schirrous breast is united solidly and in substance, with the pectoral muscles, and the ribs : in the present case, the fascia, descending from the zygoma over the surface of the tumour, was identified with its substance, and, when cut, was like a cartilaginous ligament, hard, and thick. The dissection of the part of the tumour which lay over the jaw, and masseter muscle, was equally rude, and imperfect ; for the tumour was equally identified with the substance of this muscle, which was, in its own substance, of a gristly hardness. The tumour, in short, adhered to the fascia of the temple, to the zygoma, to the masseter, to the jaw-bone, and to the cartilaginous tube of the ear ; from all of which, it was more or less rudely or delicately dissected ; but with such

excruciating pain that Mr. S——, though a man of the most perfect composure, courage, and constancy, grew deadly pale, hiccuped, fainted, would have fallen from the chair, had he not been supported, and that so early in the operation, that even his neckcloth was not yet stained, at least not wet, with blood.

“ We were obliged to lay him down, to lave cold water on his face, to suspend the dissection for a whole quarter of an hour ; this was in the beginning of the operation, which lasted ten minutes after it was resumed.

“ The first artery which sprung was the transversalis faciei, but it was too small to be heeded, and it was to be cut again, wherefore I disregarded it, and it shrunk : the next artery, in dissecting the lower part of the tumour, was the labial or facial, where it turns round the angle of the jaw ; in this, as in all other dissections of the like nature, it stood out from its cellular substance so insulated, to the extent of half an inch, that I found it easy, without the needle or tenaculum, to cast a ligature round it, by laying the loop of the ligature over its mouth, and drawing it : the third artery was the great temporal artery ; the manner in which it presented was not pleasant, for, first, in dissecting downwards that part of the tumour which covered the zygoma, the artery was necessarily opened ; but, knowing that I had not approached any dangerous point, I clapped the point of my left fore-finger on the mouth of the artery, while grasping the body of the tumour in the hand, I continued to dissect it downwards from the temple, and to dig it away from the cartilaginous tube of the ear ; then, lifting the point of my fore-finger, the mouth of the artery appeared in the very centre of the tumour, throwing out its blood, and was tied. By dissecting the gland down from the zygoma, and from behind the angle of the jaw, I had almost touched the point where the carotid forks into the internal maxillary and temporal arteries ; to have gone further, would have been rash and unpardonable ; the next stroke of the knife would have truncated the carotid artery, and left no possible chance of saving the patient, but instant compression of the artery at that point with the thumb, and a desperate dive with the crooked needle at that part behind the angle of the jaw, where the trunk forks into the external and internal carotid arteries.

“ I wrought so successfully with my fingers, as to insulate the gland all but a trivial root ; I then pushed the flat handle of the scalpel round and round, so as to lessen that root still more : I next with the fingers alone passed a big and thick ligature round the root of the tumour, and tied it in a general way, and by the hold of this ligature was enabled to turn the tumour round like a button upon its stalk, and by compressing it, was

enabled to feel more distinctly to the root of this slender neck. I believed, but I was mistaken, that I could drive the eyed end of my needle through this; it was of far too firm a substance for any such attempt; but resolved any way to get at its root, I turned at last the point of the needle to this pedicle, struck it through behind the general ligature, and having thus carried a very thick waxed ligature through the root, I cut the ligature at the eye of the needle, tied two of the ends round one side of the tumour, the two others round the other side of the tumour, then crossing them, and bringing the respective ends round the opposite sides of the tumour, I tied them again; and as this was the point necessarily including the portio dura, or great nerve of the side of the face, the drawing of the ligatures proved the most cruel part of the operation, was accompanied with an outcry of intolerable suffering; the cheek fell paralytic, and became instantly oblique, and I was impressed also with the conviction, that I had so pulled out the gland by the help of the general ligature from its deepest seat, betwixt the jaw and temporal bone, that I had, in tying the root of the schirrous gland and the portio dura, tied also the carotid."

"The gland was cut off, and only a button left with those ligatures about it: the whole operation was bloodless: at the first dressing, at the distance of four days, the whole surface was found in a state of kindly suppuration, but the ligatures, especially that which encircled the lower part of the tumour, needed to be drawn firm, which occasioned once more excruciating pain, which continued through the whole night, during which our patient was feverish and restless. On the second dressing, at the distance of seven days from the operation, I found the gland, or the remains of it, not killed by the ligature, but adhering round all its edges, to the surrounding parts; and especially I found it adhering firmly to the flap of the ear. I disengaged the adhesions with the probe, and examined the ligatures and found them loose; but having fixed them with running knots at the last dressing, I now finding it impossible to draw them tighter, took another method, viz. passing the ends of the upper ligature through the eye of a large crooked needle, and carrying it, eye foremost, round the gland, I carried the same ligature a second time round the neck of the tumour, and tied and drew it again with considerable pain. The button-like head and neck were now so hard and brittle, that I might safely have snipped them across, but I thought it best, since the ligature still occasioned pain, to leave it to kill the part completely. At a third dressing I found still the gland not killed, but adhering to the ear, and bleeding when touched, so that Dr. Monro could not be persuaded that the ligature actually surrounded the tumour. I drew the ligature now a



fourth time with great pain ; I waited for its sloughing, as this root of the gland seemed to delay the cure, which was otherwise far advanced ; but at the next dressing I found the tumour hard, brittle, entirely blackened, and turning in every direction upon its narrow neck, which I twisted off with a very slight twitch, merely by turning it round and round. The surfaces suppurred fairly, and granulated ; and the cheek healed evenly and well : but the pains never entirely ceased ; our patient had rheumatic feelings in all that side of the head, always referable to the diseased part : they were increased in moist weather, or when the east wind blew. He retired to a delightful climate near the mouth of the Clyde, and while there the thickening of the parts daily lessened, and I flattered myself he would entirely recover ; but after receiving from our patient a succession of very afflicting letters, he returned to me in the month of January, in a very calamitous situation, with the tumour almost as big as in the month of July, when the operation was performed, and having all the aspect of a part ready to burst out into cancer. The surface and the cicatrix, and all that belonged to the skin, seemed to be particularly diseased, and prone to ulceration. Three points stood particularly prominent like knuckles, from the centre of the sore : these were the three corner points of the skin formed by the triangular incision ; they were of a dull red colour, extremely painful, with an indistinct sense of fluctuation, or rather of boggyiness, (soft and hard mixed,) and resembled in short the livid skin of a schirrous breast, when the operation having been unsuccessful, the part is about to burst into open cancer. The pain which had for some months been moderate and tempered with intermissions, was now unremitting, extremely severe, shot across the cheek during the day with stunning violence, and at night was so fierce and intolerable, like the burning of live coals, that he wished for ice to apply it to the side of his head ; and even with these large doses of opium which he had learned to use, he passed much of the night without closing his eyes. With Dr. Monro's consent, the usual, the hopeless, prescriptions of hyosciamus and mercury were given him, and he returned to the care of his surgeon at home, whose letters announced to us only a succession of sufferings daily more and more, and were terminating at last in a fatal cancer : he survived but a few months."

Those more ordinary operations on tumours rolling under the skin, insulated, easily extirpated, and which we know it to be our duty to dissect out, as a measure of precaution, I need not describe to you ; but those in which there is any thing either singular in the place of the tumour, or critical in the dissection required, I hold it my duty to represent ; and I am permitted

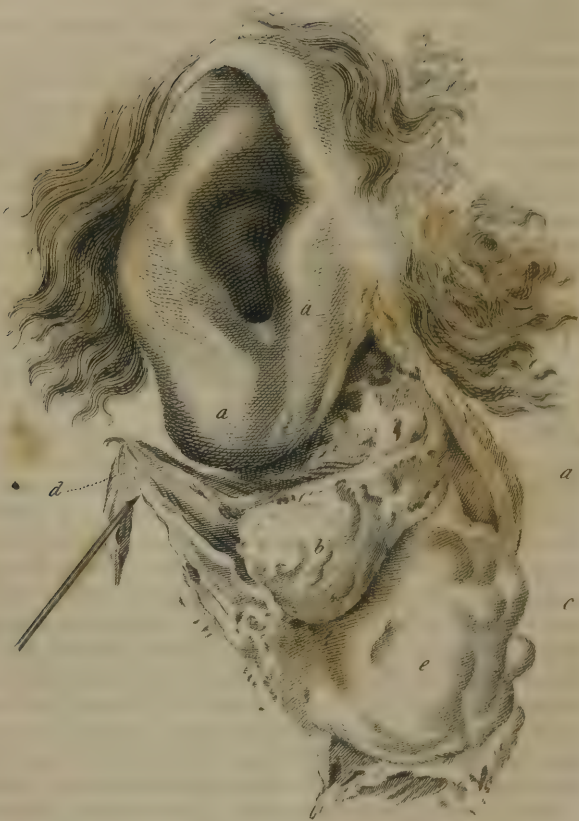
by Mr. Dunlop, surgeon in Glasgow, to explain to you some things very singular in the operation which he found it prudent to submit to in his own person.

Mr. Dunlop, surgeon, after deliberate and frequent consultation with his father, resolved to rid himself of a continual anxiety in regard to a glandular swelling, deep seated, lying immediately under the lobe of the ear, and which had been increasing, though slowly, for five years. No well instructed surgeon could be indifferent to the consequences of such a tumour in his own person. Had the gland been a mere scrophulous swelling, he might have waited the event patiently, of its suppurating, shrinking, or remaining stationary ; but a gland, hard as a stone, gradually increasing in size, deep seated, extending its adhesions, and connecting itself with the carotid artery and portio dura, was not to be long disregarded. Much as I have been in the habit of comparing external with the corresponding internal parts, and planning operations, there were many things in this dissection altogether unexpected, and for which I was in no shape prepared. I felt (more than even in those cases in which I had been correct in my conjectures,) the necessity of thinking long before lifting the knife: I was sensible of something very uncommon and anomalous in this tumour, for though it did not seem to adhere, it lay very deep, though moveable, its form could not be distinguished, though extremely hard and globular, it seemed to be covered with coats of an extraordinary and unaccountable thickness ; and, if I can pretend to remember any conjecture I made, it was a very mistaken one, viz. that the fascia, fat, and cellular substance had thickened to a singular degree over it. But Mr. Dunlop, passionately desirous of being rid of the tumour, required that I should perform the operation without delay.

The usual apparatus of knives and needles, a fork to transfix and hold the tumour with, tenacula and dissecting forceps, together with sponge, and a long bandage being prepared, I began my operation by an incision carried over the centre of the tumour of three inches long, running behind the line of the jaw-bone, and parallel with it from the tip of the ear downwards ; the edges of the skin being then drawn strongly to either side, I proceeded to dissect the tumour, but after I had dissected off the fascia, the tumour seemed still soft and shapeless ; nothing like a firm gland or circumscribed tumour appeared ; what presented under my knife was flat and fleshy, and undefined ; and when this fleshy mass was pinched up betwixt the finger and thumb, the hard tumour was distinguished under it: I now recollected that I was cutting directly over that part of the parotid gland which lies behind the angle of the jaw, and as instant-







ly distinguished, that the surface I had laid bare, was no other than the flat white granulated substance of the gland. I perceived that the tumour, the object of my operation, lay under the parotid : I first dissected round this lobe of the parotid on each side, then turned off the lap of the parotid, or that lobe which lies behind and under the ear, and then saw the indurated gland lying beneath it.

This was assuredly a delicate piece of dissection ; for first the lobe of the parotid was turned back and carried behind the angle of the jaw, at that point where the division of the external carotid enters into its substance. Under the gland lay the trunk of the carotid, and the space was far from being free for making so dangerous a dissection confidently : there was no want of courage on the part of my patient, but it was somewhat of an obstreperous and boisterous kind ; for having imagined the tumour a simple and moveable one, to be cut or dug, or torn out easily and quickly ; he was provoked at my tedious way of dissecting, and called for a mirror to inspect, if not to direct my incisions. The gland itself was now laid bare with its glistening bluish capsule of cellular substance, and while the lobe of the parotid was held up by my assistant, I dissected cautiously and slowly into the angle, to separate the tumour from its connections. In the accompanying sketch, No. 17, made instantly after the dissection, the sides of the incision are marked (*u a*) the parotid gland held upwards by a hook struck through the fascia is marked (*b*), the tumour lurking under it, and entirely enveloped in it, (for it is flat and cushion-like,) is marked (*c*). The operation lasted long, and was not a very tranquil one : but it was safe, and by making the incision merely longitudinal, without any cross incision, and immediately under the whisker, and by pinning it nicely and delicately with fine sewing needles, and laying slips of court plaster curiously betwixt each needle, the adhesion was accomplished in a few days, with only a very slight leaking of pure saliva from the wounded surface of the gland, which lasted but two days, and in eight days my friend was well and had returned home : it is by his express permission I lay this slight sketch of the dissection before you.

Slight as these difficulties may appear in this narrative, it is fit you be aware of them ; for the young surgeon, in the moment of seeing something altogether unexpected, a flat and shapeless mass, in place of a firm circumscribed gland, is in danger of losing courage, and falling into confusion. I hope I need not remind you how unpleasant an accident it would have proved, had a young and thoughtless operator in these circumstances proceeded rashly, and cut across the parotid, mistaking it for the tumour, or cut at a venture, down into the angle where the

**Carotid and Portio Dura lie.\*** It is just such a tumour as this, that by adhesion and induration affects all the surrounding parts, becomes too formidably connected to be extirpated, and at last, by causing cancer and destruction of the bones, and by its enormous size, lays the patient's head upon the pillow from which it is never to be raised again. I have once seen, just from so slight a beginning, a boy with an osteo-sarcomatous tumour of the head, where bones, muscles, and glands, were all massed in one common tumour, big as the original head, of a weight too great for the neck to raise, and which, when it was to be moved, was moved with the help of both hands; the lad died of stupor and apoplexy, from suppuration of the brain.

It has often struck me that the things a surgeon ventures to do in the moment of operation, resemble in one respect those which a soldier does in mounting a breach: what is past looks like a dream, and upon returning to the scene, and considering the danger that is over, he shudders at his hair-breadth escapes, and is conscious of having done, what he can never venture to do again. This has been especially my feeling every time that I have, in turning over my case books, glanced my eye on the following case of Jane Sharp.

JANE SHARP, aged 27.

January 15th

M. J. Bell.

"About 12 years ago, without any evident cause, she observed a small very painful tumour forming immediately under the right ear, which gradually increased for four years, until it had arrived at the size of a large goose's egg, rising up anterior to the ear. At this time she had it cut out; during the operation she lost a considerable quantity of blood, and suffered great pain; since which she has been unable to move the muscles of that side of the face, which are paralysed, in consequence of the division of the Portio Dura, or facial nerve. About a year after, the tumour began again to form, accompa-

\* The sketch of this dissection explains the difficulty and delicacy of it. The lobe of the ear is marked (*a*); it was from the hollow betwixt the ear, the angle of the jaw, and the vertebræ, that hollow where the carotid arteries lie, that the tumour was dissected. In order to avoid deformity, I had made the incision longitudinal only, and not very long, no more than three inches; (*b*) marks the lower lobe of the parotid gland, which in its natural situation extends almost to the angle of the jaw, and which in this case entirely involved the scirrhus gland; but at (*b*) the parotid was dissected from the surface of the gland, turned upwards and held aside by the hook, till the gland (*c*) was dissected out from beneath it. The whole appearance of the parts was in this case like that of a dissected hernia, the fascia of the gland (*d*) resembled in some degree that of the herniary sac; the parotid resembled a thickened omentum, which being turned aside exposed the gland, as the laying aside of the omentum in operating for hernia shows the turn of the incarcerated intestine.



nied occasionally by lancing pains; since which time it has increased gradually. It is at present about the size of a large hen's egg, hard, unequal on its surface, quite colourless, and at times accompanied by stinging pains. It extends considerably behind the jaw, and on the anterior part of it is seen the cicatrix from the former operation."

17th.

A tolerable night's rest, no hæmorrhagy, but she complains of pain in the throat and difficult deglutition.

18th.

She complains to-day of difficulty of breathing, the pain of the throat continues, the bandage being slackened, there is immediate relief to both, she sleeps ill, opium is substituted for the draught.

19th.

The sponges adhere firmly to the surface of the wound, there is little tension or inflammation of the parts, but she still complains of the pain in the throat, chiefly on deglutition.

20th.

Two of the sponges were removed with little difficulty or pain, no hæmorrhagy. The wound is filled up with lint.

22d.

All the sponge is removed.

25th.

The discharge is copious.

February 4th.

The cavity fills up rapidly.

15th.

She continues to do well.

25th.

She was dismissed nearly well.

Report of the Operation by Mr. Bell, January 16.

"The one half of the parotid gland, that which lies behind the angle of the jaw, had been left: the scar of the former operation was on the fore part of the tumour: the tumour lay behind and under the ear, pressing deep betwixt the mastoid process, and the rising branch of the jaw-bone. It seemed outwardly a small tumour, but it had shot down very deep, adhering to the pteregoid process and to the back of the pharynx. The dangers of the operation were these; the portia dura, and the 9th pair of nerves passed through the tumour: immediately under it lay the trunk of the carotid. The external carotid behind the lower jaw, but chiefly the large jugular vein, was in danger, for the tumour lay so entirely under the mastoid muscle, that part of the muscle is taken away with the gland. The

gland being dissected free in its lower part, where it lay near the carotid artery, was torn up from the roots where it adhered to the back of the fauces. The internal maxillary artery bled very profusely; a small piece of sponge, the size of the thumb, and supported by other pieces of sponge filling up all the hollow, was pressed upon the artery at the back of the nostril. The swelling of this piece of sponge caused a difficulty of deglutition, which ceased when the sponge was removed. After the operation I put my finger into the hollow whence the gland was extracted, which I felt to be two inches and a half deep; at its lower angle, (i. e.) behind the corner of the jaw-bone, the carotid lay bare, beating strongly, not dilated; the upper part of the wound was deep, so that the finger touched the pteregoid process forwards, and the apophysis cuneiformis of the occiput backwards; and when she swallowed, the morsel, in passing down the pharynx, pressed upon the point of the finger."

When it happens that a glandular swelling, small in its first stage, and but too little formidable to excite alarm, grows in its second stage to such magnitude as plainly to require extirpation, which the surgeon, even after he has begun the operation, dares not complete; when the same unhappy person presents himself again, claims the assistance of the surgeon, willingly offers to subject himself to any operation, however severe or cruel, but is by a formal consultation rejected and bereaved of all hope of relief, is not the doctrine explained in my preliminary observations, but too certainly proved? In this sense I venture to call your attention in a particular manner to the case which I am now to relate, and to the reflections which occurred to me on this consultation.

"Jenny Brown was a poor solitary thing, who worked laboriously to maintain her aged mother, her father being some years dead: she slaved at all kinds of work as an out-servant in a farm-yard. After churning milk, being exceedingly heated, she went out with her cap loose, and jaws exposed, and by carrying bundles of wet grass for the cows, upon her head, had a severe toothach, for which a tooth was pulled, and still continuing the same labour, she got cold; thence arose a kernel-like swelling of a gland under the lower jaw near the gum of the corrupted tooth. Her face was swelled, so that her eyes were closed; the lump grew as big as a hen's egg, with severe pain; the swelling of the face subsided, the pain ceased, but the glandular tumour remained.

Whenever an operation is ill-concerted; when the surgeon proceeds to extirpate a tumour with this vulgar notion in his head, "we shall try to take it away," he is almost sure to fail:

accidents, no doubt, will prevent the most dexterous surgeon from accomplishing all his purpose, and a zealous man will sometimes attempt what he dare hardly perform; but a surgeon really acquainted with the uncertainties and difficulties of his profession, will, even in the least dangerous circumstances, reflect long and much on the nature of the tumour which he is to extirpate, and the anatomy of the adjacent parts; whether it consists of various smaller glands, or of one only; whether it has its arteries from one point or stem, so that it could be dissected round and insulated, this point being left to the last entire, or from various sources, so as to make a slow and bloody operation necessary; whether these arteries must be cut near to their going off from some large trunk, as the carotid; whether a large vessel itself, or its immediate branches, may not be entangled in the roots of the tumour. Such calculations I will venture to say never entered into the mind of the operator, who first adventured to extirpate this tumour: he entered upon it with little premeditation, and stopped short at the first slight appearance of danger.

To extirpate any tumour safely, you must keep to its surface; dissect cellular substance only; never touch, if possible, its system of vessels; if once you plunge into its centre, you are inundated with blood, (unless it be merely a steatoma) and your future dissection is irregular and imperfect. A very long incision being made, the operator seemed to me to plunge into the very heart of the tumour, several arteries (not, it is manifest, of very dangerous size, for he had never even approached the roots of the tumour) threw out blood, all the assistants thrust in their fingers to stem the blood, and the operator taking advantage of this consternation, little confident in himself, and having calculated no circumstance beforehand, obtained an easy and unanimous vote, that the incision should be sewed up. This was to me manifestly the result of an imperfect knowledge of the route and size of the several arteries, of the error of cutting towards the centre of a tumour, and of the worst of all faults and weaknesses, that of turning round with fear and trepidation, in the midst of occasional difficulties, to consult those, who from the moment an operation is begun, should be no more than spectators. It proceeds from a paltry desire, to make the attendant surgeons parties, not to the general operation, for which they have given their voice, but to each step of it. Let the surgeon act from himself according to the best of his judgment, cut slowly when he is conscious of approaching too near the great vessels, and stop when alarmed by that immediate sense of danger, of which he must be the sole judge, or at least the most competent.



One advantage this poor creature derived from this unsuccessful operation, viz. the relief from pain, for she was relieved by the loss of blood, insomuch that she recovered her health, and, in some degree, her strength, and returned to work, for the support of her old mother; at least she could spin. For a long while she has been unequal to this; she has lingered and wasted in a very helpless condition, and is now in a state of extreme weakness for want of food: she walks but a few paces without stopping for want of breath; her swallowing is difficult; she has great pain night and day from the mere distention and size (I am persuaded) of the tumour, which is not reddened in the very slightest degree: the weight of the tumour is intolerable, and it appears to me that, in not many weeks, at the utmost in a few months, she must be released from her sufferings. She has saved one shilling to enable her to travel to town, from the village she lives in, (Falkirk) which is about 20 miles distant; and now, from the first and unsuccessful operation, she presents herself, after no great lapse of time, with a tumour so enormous, as to make the question of operating difficult to resolve, but in a condition which admits no delay, she is sure to die, and willing to suffer any thing which may tend to save her life: there is one inducement to comply with her request, viz. that she must surely die, though from no other cause than the bulk of the tumour: the tumour not being cancerous, leaves us nothing to dread after the operation.

A consultation has decided that no operation can be performed. I imagine there are very many safe and easy ways by which this tumour, great as it is, may be extirpated, or destroyed; and, reflecting upon the possible success of such an attempt, I think I have estimated the dangers fairly, and as impartially as if the operation were my own appointed task.

This poor creature's difficulty of breathing seems to me to proceed as much from the weight of the tumour, as from the hold it has upon the parts; from the immense mass resting upon the trachea and oppressing even the breast. The tumour has every character of what is usually called a wen; the whole mass incredibly hard in proportion to its bulk, so that she supports it continually with a sling round the head and neck: it is extremely firm, not very vascular throughout its substance, but receiving its arteries at particular points; it has no great veins running over its surface, whence it may be presumed that it has no very irritated circulation, nor any thing of a cancerous nature. The whole surface of the skin is healthy and free from redness or any blemish, except where the scar of the former operation passes obliquely over it: it is plainly glandu-

lar, the most prominent parts indeed consisting of individual glands: two large distinct prominences lying one before, and another behind the ear, form the chief bulk of the tumour at that part, and are plainly separate glands, moveable both in relation to each other and to the main tumour. The extirpation of that part which lies under the chin could give us no concern; there we could cut no arteries but the facial, which would be divided in separating the tumour from the line of the lower jaw: its own weight seems to have lengthened its root, and drawn it down from under the ear, and from the angle of the jaw: it hangs so that I can push the points of my fingers deep behind it, without feeling any strong adhesion, and, I am confident, it has no dangerous connection with the carotid at that critical point, where it forks behind the jaw-bone into the external and internal carotids. I am confident that the carotid and great jugular vein lie together safe in their sheath, while the tumour, lying external to the sheath, might be dissected away from it, from the mastoid muscle, and from the vessels beneath quite safely, as we often find immense tumours of the thigh (equal almost in size to the patient's body) are dissected from under the Sartorius muscle, without injury to the femoral artery. The worst effect of the tumour, and the most dangerous adhesions of it are to the side of the throat, to the os hyoides and its muscles; there, by pulling down the os hyoides, it makes the swallowing difficult, and oppresses the breathing by its weight; and at that point there might be infinite trouble from arteries proceeding into the body of the tumour from those of the thyroid gland. But the tumour is, by its weight, dragged so away from the jaw, and admits the points of all the fingers ranged in a line, so deep on all sides, that, though I foresee much difficulty, I find no absolute danger in the attempt. Yet it must be done by one who goes not to work with the general and confused notion, of extirpating the tumour "as circumstances will admit," and, proceeding according to the best of his judgment. His judgment must be decided and designs matured before he begins; he must calculate at what points the arteries enter; what the probable size of those that come from under the chin, from the lingual arteries; what the size of these derived to it from the facial, where it crosses the angle of the jaw; what the size and probable direction of those coming to it from the occipital, or temporal branches of the carotid; or those deep ones coming from the thyroid arteries; he must resolve in what succession to cut them, and, with what precautions. The surgeon, who sees an artery throw out blood furiously, and in the neck too, not knowing from what spot it comes, must instantly fall into great confusion: but if he has calculated every probable

danger, he is prepared, and his patient comparatively safe. In the present case, the incision should be made, not over the centre of the tumour; the purpose of saving all the skin which invests it, is absurd, and the conception of dissecting into its substance, extremely ignorant. The oval incisions should be made to encircle its upper and lower parts; there are points in which it should be opened freely, as there the chief dissections are to be performed. The great and dangerous dissection would be in the line of the lower jaw, about three inches from it, and extending from behind the ear to the throat: the skin being laid back, this dissection would follow the convex of the tumour; the tumour falling by its weight would widen the incision and expose the parts, the left hand laid upon it would press it down, while the assistant retracted the skin; the fore-finger of the left hand would guide the dissection; the point of it, fixed upon each lesser artery successively as it bled, would stop it till it shrunk: the form of the tumour, the line of incision, and the direction of the jaw-bone, would keep the relation of parts distinct; the operator would certainly know when he approached any dangerous point; in drawing down the tumour, and dissecting it from under the chin, he would cut branches of the lingual arteries; pressing the tumour next down from the angle of the jaw, he would cut the facial artery; and would go no further in that direction; having tied the facial artery, he would next, in tearing away the tumour from under the ear, divide branches of the occipital and temporal arteries: it is the seeing those arteries bleed furiously in succession, without foresight, without knowing from what trunks, in what directions they come, or knowing what may next happen, that makes an operation seem bloody and dangerous.

In next dissecting deep into the angle or cavity below the jaw, there must be danger; every incision must be made with caution, the point of the fore-finger must go before to feel for the beating of the carotid artery; and much should be done now by laceration, the tumour being inclined first from the chin backwards, then from the occiput forwards, and pulled so as to give a distinct feeling of the parts with which it is connected, whether, for example, pulling upon the tumour moves the os hyoides fairly along with it, whether the tumour sends down roots, involving the carotid and internal jugular vein: this deliberate and daring proceeding would, I doubt not, enable the surgeon to approach by dissection, or laceration, quite close to the only dangerous point, *viz.* that where the carotid lies under the angle of the jaw: if, having reached that point, he found a clear and distinct cellular substance to lead him in his dissection, he would, pressing aside the dangerous parts



with his finger, continue it with equal deliberation through its next stage; if he found inextricable adhesion, and increasing hæmorrhagy, he would stop; but, having so far insulated the tumour, he could, if forced to stop, tie its root, even though several inches thick, and strangle it, if not with a surgical ligature, at least with a garter or coarser string.

I should not, in the slightest degree, shrink from such an operation, and would dissect so very large a tumour with less reluctance, than many a smaller one I have dealt with. I have even a persuasion, that this second stage of growth may be accompanied with circumstances favourable to the operation, the weight of the tumour elongating its roots, weakening its adhesions, and concentrating its arteries. I beg leave to remind you of another circumstance in such an operation, which you will do well to attend to. Do not dissect in haste and in a hurry, for by time and circumspection, you can accomplish things which seem impossible, and I would explain my opinion and my practice more fully thus: "Would there be much danger had you to deal at once with one only of all the arteries which are cut in extirpating a tumour?" None assuredly.—"Would there be much additional danger were the pain of this dissection extended from a quarter of an hour to an hour?" None. Let us apply this reasoning to the case before us: I have uniformly found, that permitting the blood to stop entirely, and the incisions to become dry before binding up a wound, contributes to its speedy adhesion; in all operations I wait long: this is with me one universal rule in operating. I have as uniformly found, that, when a dissection became perplexed and confused, the taking up of the large vessels, and allowing the bleeding from lesser ones to cease, and waiting till the surfaces get that raw look, which betokens the drying up of the blood, explains every thing, and restores that clear conception which I had at first of the relation of parts, of the arteries I have actually cut and tied, and of those which are still endangered: and this I regard as a rule in all difficult operations. In dissecting this tumour, or such a one, I am convinced that the danger might be brought within very narrow limits, and am confident that, in the present instance, even the lower lobe of the parotid gland, as well as the sheath, containing the carotid artery and internal jugular vein, lie under and behind the tumour; in short, that the gland lies betwixt the tumour and the artery, and defends it.

But are there not various ways, independent of direct incision, for working out, or weakening the roots and adhesions of this, or even of a more formidable tumour? May not a greater enterprise than this be achieved by partial incisions,

by ligatures, or by both combined? The two great globular knots which form the upper part of the tumour, and project before and behind the ear, are, I am persuaded, so insulated, that they might be dissected away by one operation, reserving the great mass of the tumour for a second: or the operator might go as far as he safely could by direct incision, and then striking a long needle, like those with which I have been accustomed to transfix large strumous sacs, pass a ligature through the tumour to be tied on either side of it; or the tumour, I am persuaded, might be so pulled away from the throat, and the long and crooked needle I speak of passed so cunningly round and under the tumour, as to pass the ligature round it without any preparatory incision. It is possible to penetrate so into the body of the tumour with caustic, as to pass a ligature through its centre, and after extirpating the chief mass by stricture, to destroy the roots by a continued use of the caustic. It is possible, without penetrating into its centre, to dissect up one side, or to pass the long needle obliquely through one side, so as to give a hold to the ligature, make it embrace the neck of the tumour, and by twisting it with a tourniquet (made by twisting a stitch in the ligature, and slipping a piece of pasteboard under the knot) from day to day, mortify and extirpate the whole mass.\*

But there is no need for subterfuges in a plain and simple piece of dissection, which, though not without danger, is vindicated by the suffocating condition of the patient, and by the inevitable nature of that death which awaits him, an operation which, though not absolutely safe, is so, in the hands of a dextrous surgeon, witness the following most interesting case. The most considerable tumour, seated in so dangerous a part as the neck, which I have ever in my life extirpated, (says M. Petit) occupied all the side of the face, neck, and jaws; it was almost entirely circular, extended from around the ear, both before and behind, upwards to the angle of the eye, forwards to the corner of the mouth, and downwards over the jaw, along the neck, to the articulation of the clavicle with the acromion process. It was seemingly eight inches in diameter, and the

\* My reader, unless he be a practical surgeon, will not readily feel the reason of my enumerating thus the many resources which will present themselves, nor the sad necessity of having recourse to so many means. What dangers in the way of operation, what continued tortures by any slower and less dangerous method, will not a man undergo to save life? This poor creature probably died, as thousands have died, in a state of protracted suffering; and the surgeon who has witnessed such a scene, who has felt compunction at having lightly dismissed a patient in the early stage of a tumour, which has afterwards proved fatal, or who has felt the difficulty of deciding when a tumour was plainly to prove fatal, but yet too deeply connected to allow of extirpation, will think over all the possible resources with sincere interest.

patient, about 50 years of age, had carried it twenty years; for it was of slow growth, its first beginning being a glandular induration, seated about two inches under the ear, and lying on the mastoid muscle.

When this tumour was no bigger than the fist, I advised him, and often repeated the advice, that he should have it extirpated. When he refused, I prescribed such discutient remedies as I imagined might have some effect; and every time I repeated my advice, he rejected it entirely, because he could still conceal the tumour under a voluminous peruke, such as was then in fashion: but the tumour increasing in bulk, so as no longer to be concealed, and growing so painful as to excite alarm, he convoked a number of surgeons to have their advice. I alone, of all the gentlemen consulted, advised the extirpation of this tumour; each of us, as the consultation was not held in the presence of the patient, spoke his mind freely; and when it came to my turn, I explained myself thus: "Of all the reasons, gentlemen, which you have advanced against the operation, one only affects me, and that is the fear of hæmorrhagy from the numerous arteries of this tumour, which not having one root or pedicle, would bleed at once from all points, and from the number of its arteries, some most likely of considerable size, the patient might lose much blood, perhaps his life. These, said I, are the dangers, but have I not skilful assistants willing to stand by me? What then should I fear? I shall cut away the skin along with the tumour which it covers, because they adhere, I shall first dissect away the part that lies over the cheek, and some one of you appointed for that duty, shall be ready to clap a finger on the first artery I cut; and as I proceed in my dissection, he will have a finger ready for each artery that springs. Thus shall I pursue my operation, and whatever number of arteries are cut, so many fingers will there be ready to compress them; and the whole being accomplished, finger after finger being raised, first from the greater arteries, and next from the smaller, each in succession will be secured with the needle and ligature. The scheme was acceptable to all of them. It was deferred only till the following day, and never was a project better fulfilled, for never perhaps had a young surgeon so many of his masters in surgery to support him. Arnould, Tribauld, and the elder Le Dran, held their fingers on the arteries. The smaller ones of the eye-lids, lips, &c. were considerably dilated, but those which occasioned the most trouble were the anterior and posterior branches of the temporal artery, and the facial where it turns round the lower jaw. Each ligature held its place; at the first dressing not a



drop of blood flowed; in two months, or little more, the wound was cicatrized.”\*

You will observe that M. Petit's confidence in undertaking an operation so formidable, arose from a conviction of the tumour being superficial; not under the mastoid muscle, but above it; not connected with the carotid artery, but endangering only the temporal, and facial branches. But the question is a very awful and serious one, when the tumour is seated beneath the mastoid muscle, projecting from under it in consequence of its great size, and probably connected at its root with the sheath which includes the carotid artery and great jugular vein: such a tumour, if firm, glandular, growing rapidly, and pressed inwards by the perpetual bracing of the mastoid muscle, will connect itself so with the parts beneath by adhesion as to make its extirpation dangerous in the last degree, and it will at the same time press so upon the throat as to make the attempt an act of necessity and duty. Often I have had occasion to consider the anatomy of this part of the neck, and especially of the vessels and nerves lying in the angle under the jaw-bone, but never more anxiously, than when preparing for the following operation. The subject of it was a gentleman about 35 years of age, of the best, and most grateful dispositions, and the stoutest heart. He confidently required me, on my allegiance and duty, to perform the operation if I found it at all consistent with safety, although it had been forbid in many former consultations with other surgeons: his courage was not in words only. While I performed a very painful and slow dissection, he sat like a monument. The tumour projected from under the ear, of a stony hardness, and of such a bulk as to fill up all the angle betwixt the ear, jaw-bone and neck: it extended backwards behind the ear three inches, forwards to the chin, and downwards along half the neck; it already displaced the larynx and throat, pressing them over towards the left side; and made the swallowing difficult, and the breathing so laborious, that he could no longer sleep at night, but started out of bed, partly from suffocation, partly from fear; it increased withal very rapidly in size. The sum of the opinion which I delivered to him in writing was this: “that a tumour so situated could not cease to grow, and could not fail to produce, at no very distant period, the most distressing consequences: that upon comparing the tumour with the great vessels and nerves of the neck, it was my persuasion, that though it lay upon the great carotid artery and jugular vein, it had no essential connection with them, and that the only arteries

which would be unavoidably cut were the temporal, occipital, and facial arteries: that the carotid, with its accompanying vein and nerve, were involved in their own peculiar sheath; that the angle where the great carotid branches into the thyroid, facial, occipital, and temporal branches, was protected by the mastoid muscle, and by their sheaths of cellular substance: that I thence inferred, that, though no such operation can be void of danger, there was in the present case, nothing to deter the surgeon from attempting so needful a duty: that I should with pleasure assist at this operation, or with equal alacrity to perform it; but, that I conceived it a necessary privilege that the surgeon, who made himself responsible for the life of a patient, should be entitled, in all irregular operations, especially in one so full of danger as this, to stop at the first apprehension of danger."

The history of every tumour must be alike: and I found in the history of this particular tumour nothing interesting. Were I inclined to draw any inference, from what my patient told me of the origin and growth of this tumour, or from the severe and dangerous operation he was forced to submit to, it would be that so strongly enforced in my Preliminary Discourse: viz. That no tumour, when it passes the usual limits of a swelled gland, and begins to adhere to the surrounding parts, should be permitted to grow; for this too, like that of Jenny Brown, was but a swelled gland. The description of every dangerous tumour is delivered by the patient in the same phrase, "It began like a little knot or kernel, and grew slowly:" it is therefore unnecessary to detain you with insipid and trivial details of its growth.

My first desire, on all occasions of danger, is to make just conjectures in regard to the internal relations, and probable adhesions of the tumour; and on these to found a true prognosis, to be delivered to the patient, or his friends, and a rational scheme of the several parts and steps of my intended operation. First, I found the tumour of very formidable dimensions, projecting to the perpendicular height of four inches, and terminating in an apex, which stood as prominent from under the ear, as the chin from the face and throat; and this pointed apex was the smallest part of the tumour, which increased in bigness towards its base, and there, especially in the part lying under the mastoid muscle, though it was moveable, because the muscular parts of the neck are moveable, it seemed solidly connected with the parts beneath it. Secondly, though that never could be regarded as a superficial tumour, which lay, in its biggest part, under the belly of the mastoid muscle; yet I found no motive for despair, for I was, by eve-

ry calculation, persuaded it had no very intimate relation to the more important vessels, but stood thus connected: it lay so close upon the carotid artery, that it entirely covered that very dangerous point behind the angle of the jaw, where the carotid forks into the great branches destined to the thyroid gland, tongue, face, and temple: that it lay closer still upon the root of the occipital artery, and covered the whole length of the facial artery, but, though deep in respect of the mastoid muscle, and firmly compressed by it, it was superficial in respect of the carotid artery, for the angle where it forks into its great branches is covered by the styloid process, and the muscles arising from it; and is even bound down and protected by them. The great carotid, the jugular vein, and the eighth pair, were not only thus protected by the styloid process, and muscles, but are farther involved in their peculiar sheath of fascia. It thus seemed to me less dangerous to extirpate even this great tumour, than the smaller one of Jean Sharp, seated as it was deep behind the ear, where the carotid artery lies; yet the degree of security, arising from this interposition of the styloid process, betwixt the angle of the carotid, and the body of the tumour, only rendered the operation possible, not safe: there were other manifest dangers to be encountered, the tumour passed under the mastoid muscle, and was so connected with its inner surface as to require that muscle to be turned entirely backwards in dissecting the tumour from beneath it; the tumour could not, without a degree of danger, be detached from the side of the throat, where, as it seemed to me, the carotid, the temporal, and occipital arteries, could hardly escape, and where the inosculation of the external jugular vein, with the great internal jugular, would not fail to be cut across, so as to cause, if not a dangerous, at least a very perplexing hæmorrhagy.

With these conceptions I formed that plan for the operation which succeeded so far, as to carry me to the very roots of the tumour, and save my patient from very imminent danger. First, I resolved to have full room for such a dissection, and to carry the external incision obliquely across the neck, in the direction of its natural wrinkle, following, in some degree, the edge of the mastoid muscle, beginning the incision on the occiput three inches above and behind the ear, and ending four inches below the chin: Secondly, to dissect up the skin largely and widely, and, turning it back, proceed to dissect up the mastoid muscle from the tumour: Thirdly, to dissect away the tumour from the lower and lesser point, where it projected from under the mastoid muscle backwards, but not far; and to dissect it next down from the ear and from the chin, towards



the place of the carotid artery : Fourthly, the tumour and the mastoid muscle being moveable in respect of each other, in place of merely raising up the tumour gently from under the mastoid with the design of dissecting, resolved to poise it up strongly, in the intention of tearing it away from its adhesion, and gouging it out with my fingers. I perceived that using my knife here, though it might not much endanger the carotid, would wound its branches close to the trunk. I considered laceration as the true principle of our proceeding in all such dangerous points, and the thrusting in a piece of sponge, as the best means of suppressing any occasional hæmorrhagy. I have gouged out tumours with the fingers "more laniario," which I should never have dared to attempt with the knife.

From this plan of operation, I confidently expected that there would be no other hæmorrhagy than from the general wound, viz. blood oozing out slowly, from the cut-surfaces, as menstruation does from the surface of the womb; unless it were that sudden gush of blood which flows from the jugular veins when cut across, but which will cease instantly, and will be distinguished by its black colour and by the want of pulsation, so as not to create even a momentary alarm.

This plan I put in execution with great success, and it rests upon my own mind as a conspicuous instance of an operation performed in very inauspicious circumstances, without spilling, I may say, one drop of blood, where it seemed difficult to escape wounding even the greatest arteries; his shirt was hardly moistened, and I had no other cause of alarm, than feeling with the point of my finger, the great arteries beating. First, the outward incision of fully eight inches long, being carried round the neck, and over the apex of the tumour, the mastoid muscle was dissected away from the body of it, and so entirely insulated, that my assistant taking it on his fingers, turned it before or behind the tumour, according to the part that I meant to dissect; and thus I dissected sometimes before, and sometimes behind the mastoid muscle. In this dissection the platysma myoides muscle and strong fascia of the neck were dissected back along with the skin. Secondly, in dissecting down the tumour from the occiput, and from the chin, no conspicuous artery bled, and my assistant, while I dissected along the line of the jaw, followed my knife with his finger-points of both hands, so arranged in a line, and following the incisions in its whole length so correctly, that, by holding down the surface from which I was dissecting away the tumour, he saved the arteries which might otherwise have been cut, and was ready, had an artery bled, to cover it instantly, and make its place by clapping the point of a finger upon it; and thus he followed the dissection over the an-

gle, and along the whole length of the jaw-bone, repressed the throat where the lingual arteries and nerves run along, and, by pressing down the carotid artery and its sheath, enabled me to carry my dissection down very low, I dissecting and pulling the tumour away from the jaws, while he repressed the parts, at one time with the line of his fingers, at another period of the dissection with a long flat piece of sponge, cut for the purpose. Thirdly, turning the mastoid muscle now off from the tumour, I began to tear upwards and dissect the lower part, that which projected, according to the natural relation of the parts, from under the mastoid muscle at its back part : and here, for the first time, I found reason to hesitate ; for this part of the tumour was connected actually with the spine, it seemed to shoot down strong thick roots, or fangs, betwixt the transverse processes ; the external branches of the nerves which proceed from betwixt the cervical vertebræ, I had no scruple nor fear of dividing across, but I was come now almost to the flat fence of the vertebræ. I was going deep behind the pharynx and the sheath of the carotid, and was sensible that the dividing the phrenic nerve, (for the principal part you recollect of the third cervical nerve is destined for the diaphragm,) would probably prove fatal. The harm I might do was terrible, the good problematical ; very little of the tumour remained, it was such as even my assistant could hardly perceive, much less a spectator, but I found myself not intitled to venture farther, I therefore cut these roots across, and, having thus delivered the patient from this tumour, I felt the great chasm left by it.—Now, Gentlemen, I am explaining these matters for your instruction, and the good of humanity, and with thoughts far above any politic regard for my own reputation, such as might tempt me to conceal or palliate any fact : the little portion that was left of this tumour I could hardly feel : I had no misgiving in my own mind beyond that vague, indefinable anxiety, which an upright man should feel after an operation, however promising, and which I have never failed to suffer from, even where most successful, for I am ever apt to imagine, that I might have performed the operation better, and this was all I felt at the time, it was only by future consequences that I was struck with regret for not venturing a little deeper.\* The chasm left by the extirpation of the tumour I next examined ; the dissected mastoid muscle lay loose and flapping, and we turned it occasionally over, from one side to the other, to look for bleeding vessels, but there were none, there was nothing

\* The tumour, in little more than a year, began to grow again ; and it is now, at the distance of two years, as large as at the time of the operation.

but the very slightest general oozing, the surfaces were dressed with lint, with a very gentle compression: the wound suppurated favourably, and healed within the month: but the tumour has grown again to a great size. Such are the difficult and distracting circumstances to which those are reduced who, from their own timid dispositions, or the ignorance of their medical friends, have allowed an indurated gland to grow and fasten itself by adhesions, to the surrounding parts, and to push its roots deep into the neck, or axilla.

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## DISCOURSE XXVI.

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### *Of Salivary Tumours.*

**BUT** it is not the discussing of interesting doubts, and questions of life and death, nor the performing operations within the extreme limits of possible success or possible safety, that constitutes the chief occupation of one engaged in practice.—The more homely talent of distinguishing the various aspects and characters of tumours, and treating them judiciously, is far more desirable to acquire; and, indeed, there is a very perplexing variety of tumours within the mouth, and round the jaws, which one learns to distinguish, only by referring their various aspects to corresponding peculiarities in the structure of the parts. The tumours which I have just described are of a very malignant character, and, I confess I know not whether to refer them to the salivary or the lymphatic glands; to the latter, rather, I believe. This, for example, of Mr. M——, though it looks like a tumour of the sub-maxillary, I know to be a tumour of the lymphatic glands: had it been a tumour of the sub-maxillary gland, which holds imbedded, I may say, in its substance, the facial artery, it could not have been extirpated without dividing that artery: the sub-maxillary gland is divided into two masses, and the trunk of this artery is received into the recess



or cleft, the artery seems to twist round the gland, and I have, both in extirpating the sub-maxillary gland, and in assisting at such operations, recognized it by this mark.

The following case, if not full of interesting particulars, is, at least, accompanied with useful rules; and I transcribe it from my case-book, with those reflections which arose in my mind, when forming my opinion and preparing for the operation, as I have ever done with a scrupulous and conscientious desire, to foresee every eventual danger, and recollect every circumstance, anatomical or pathological, which might contribute to my patient's good: the reflections, you will perceive, bear a mutual relation to the instruction of my pupils, and my own improvement. It is the case of a young Lady who came from a very great distance, urged by her own fears, and the persuasions of her surgeon, whose letter I shall transcribe.

SHETLAND, AUG. 14, 1802.

"SIR,

"Though I have not the honour of being personally acquainted with you, yet from the eminent and justly distinguished character which you hold in the world, and from my own observation of your superior skill and abilities, I beg you will receive Miss N——, a particular friend of mine, under your professional care. She has for more than three years had an enlargement of one of the glands under the jaw, which gave her not the slightest uneasiness, till of late that she has begun to feel, occasionally, some pain from it, which has induced her to take this journey, in order to have the real nature and tendency of the tumour determined; and to submit to any thing you may judge most proper. In the full confidence of your affording her every attention in your power, I remain, with esteem, your most obedient.

"JOHN BARCLAY, Surgeon."

#### OBSERVATIONS.

EVERY new operation, I perceive, will afford for my pupils some new rule of surgery, and prove to myself a source of instruction; and the various lessons which we derive thus from experience, are such as no conjecture nor previous study of the parts will enable us to anticipate; nothing but a long continued and faithful attention to practice can make a surgeon skillful, or enable him to give lessons to others.

1st. I observe in this lady's case, that the gland affected seems to be the very gland, which after an unsuccessful operation, grew to so immense a size in the case of Jenny Brown;

and in her, though the tumour arose from the slightest and most accidental cause, without any cancerous diathesis, or other malignant tendency, it proved fatal by suffocation, the most miserable kind of death. What might have become of this lady it is easy to foresee, had she not been warned by her surgeon, and alarmed by the recent accession of pain her own safety.

2d. When we are consulted what is to be done, in any particular case, we are in other terms called on to prognosticate what will be the patient's condition at the distance of one or two years: in the present case the gland is very large and of a stony hardness, it never can suppurate, it is even threatened with a cancerous inflammation, it is indeed incapable of any other; the pain requires that something should be resolved on, and our prognostic may be safely grounded on this unquestionable assumption, that such a tumour will not fail to grow, and that in one or two years the deformity and bulk, will of itself be a motive, while the suffocating condition of the patient will be an absolute reason for operating, however dangerous the operation may be rendered by such unwise delay. It is moreover to be observed, that the gland is the sub-maxillary gland, which has the facial artery nitched in betwixt its two lobes, not so inextricably indeed as the parotid is connected with the carotid artery, but in a degree to give alarm and trouble to the surgeon, and accompanied with a degree of danger (in the case of operation) which is well worth calculating.

3d. We are to regard the actual circumstances of every patient, as a part of his case, and the danger to this lady, if remanded to her own country, so far distant, and so difficult of access, is but too palpable. Should we speak to her the usual temporising language, and say, "it will perhaps get well, a slight course of mercury or cicuta may be useful, and time may do much, and perhaps it may be well to wait." It may happen that the gland may become stationary in its growth, a mercurial course may be of use, but I fear that this is in the truest sense tampering with a tumour, and that time can do nothing but increase the danger. It seems to me but too possible, that this lady, before she can take a second resolution, and accomplish a second journey, will be suffocating, and in immediate danger of life: then we shall not venture to do that operation, which is now comparatively easy; for this gland being seated in the angle betwixt the trunk of the carotid artery and one of its great branches, the maxillary or facial, will distend that angle, and both the trunk and its branch will be too closely united with the tumour to admit of an operation: or will make the operation most dangerous and critical.

4th. Though there is no imminent danger in the proposed operation, the circumstances are sufficiently forbidding to make it far from being a matter of choice. My assistant was unwilling that it should be performed without the advice of Dr. Munro, and his assent seemed rather reluctant. The tumour is of very considerable size, it is plainly the sub-maxillary gland, as may be inferred from its shape, size, and peculiar hardness; not a lymphatic gland, for then most likely more than one would be enlarged. We must be resolved to deal with this artery in one of two ways; either to dissect it so from the tumour, as to insulate the artery, and turn the tumour from under it; or should this attempt threaten to embarrass our operation, to cut it across where it lies over the middle of the tumour, tying before dividing it, lest it should shrink back towards its trunk. No one circumstance is so favourable to the operation, as that extreme hardness of the tumour, which makes the operation necessary; for that shews it to be circumscribed, and to be little connected by inflammation, with the cellular substance.

#### NOTES OF THE OPERATION.

WE had agreed either to dissect so as to lay the artery to one side, while employed in extirpating the gland; or to tie and cut across, and so proceed with greater freedom, in the more dangerous part of the dissection; but, after the first incision which I made, according to the length of the jaw-bone, the incision being long and more free, the several parts appeared in so advantageous a state, as to leave no doubt or difficulty in the rest of our proceedings. The artery presented itself arching over the diseased gland, much elongated and serpentine; so that, in place of embarrassing the operation with any needless delicacy, or endangering the shrinking up of such an artery towards its trunk, we passed two ligatures of single thread under it, cut betwixt the ligatures, and then proceeded more confidently in extirpating the gland: there we found no such adhesion of it to the trunk, or rather to the sheath of the carotid, as we had reason to apprehend; the tumour was of such a stony hardness, the cellular substance so loose, the arteries so disengaged from it, that, without the help of the knife, with only the swallow-tailed end of its handle, which I used as a scalpel, I turned out the tumour in a few seconds, and the tumour carrying its cellular substance along with it, the styloid muscles were left as clean, distinct, and bare, as after a neat dissection in the dead subject.

In regard to operations where blood-vessels of great size are



endangered, or actually wounded, I think I may safely propose those simple rules to my pupils for their general conduct :

1st. To consider well the anatomy of the natural parts, and the probable connections of the tumour, so as not to plunge unadvisedly into difficulties, which may unnerve his hand in the most critical moment ; never to endanger any unexpected bursting out of blood, such as might cause alarm : for, to wound an important artery, without having foreseen the possibility of so doing, or to encounter any danger of this nature, without having approached it by slow and delicate dissection, and provided against the sudden eruption of blood, by concerting with his assistant, what is to be done in each possible case, would be an indelible disgrace to the surgeon.

2. The surgeon, while he approaches a dangerous point with all possible circumspection, and with precaution amounting almost to timidity, and tries to avoid any important artery, or is careful as he approaches it, to distinguish it by its place, to feel it with his finger, to dissect so as to avoid, or to tie it, should, the moment the artery he fears, or any artery is wounded, and blood bursts out, dismiss all fear, then let courage and rapid execution take place of fear, or circumspection : let him plunge his finger down to stop, or to catch the artery, or dive with his needle to surround it. If there be nerves, important nerves, as in the axilla, which are endangered by this stroke of the needle, he must be prepared to decide instantly how far the danger authorises such a plunge. If the long course of the wounded artery gives him room to seek it at another point, he must be prepared instantly to run his knife backwards along its course, or to cut with his scalpel, or plunge with the needle, into the hollow where it lies, without a moment's delay ; a man who is not prepared for this by his knowledge of the blood-vessels, and able for it by his courage and presence of mind, is no surgeon.

Thus, circumspection and daring have each their peculiar point of time ; neither is to be regarded as forming a prominent feature in the temper of the surgeon ; but that knowledge of parts, and firmness of mind, which prescribes circumspection and caution in approaching a dangerous point, will ensure confident and rapid execution, when danger is actually present.

3. The surgeon, when he speaks of courage, must always distinguish the discreet and deliberate boldness which belong to his professional character, from the personal bravery, or fool-hardy contempt of danger, which he is entitled to indulge in his own individual case ; it may to himself seem heroic, or gallant, to endanger, or to throw away life ; but, when respon-

sible for that of a fellow-creature, he has no such latitude of sentiment or action, and must be guided, not by feeling, but reason. So strictly is he bound to avoid danger, that he is actually bound to afflict his patient with protracted and severe pain, to ensure his safety ; and to endure the unmerited reproaches of whatever ignorant or ill-judging person may choose to report his operations as awkward or slow. Dispatch and a show of dexterity will ever be a poor apology for endangering life,—and pain, a bad reason for hurry or perturbation, where loss of blood may be the forfeit ; the pain of pulling the stump of a corrupted tooth is more severe and often more protracted than that of the most important operations ; the pain of simple incisions is never deadly.

4. Protracted pain is attended with danger, only in those operations where, from such torturing, inflammation of some internal part, or great cavity, as the knee-joint, the thorax, the abdomen, may ensue.

There is another species of tumour, of a complexion the most opposite possible to this ; a vesicular transparent tumour, seated on the tongue : as the hydatid of the testicle, brain, liver, &c. was long supposed to be a mere enlargement of a lymphatic vessel, this clear vesicular tumour on the tongue has been supposed to be a mere distention of the sublingual ducts, which are indeed delicate and transparent, and lie in this direction beneath the tongue. One instance of this disease occurred in an infant on the breast ; the tumours had continued for several months, had been punctured three times, but returned incessantly, and had grown to such a size as to prevent the child sucking, by turning the tip of the tongue away from the nipple : there were three vesicles, two of which lay in that place and direction which correspond with the situation of the salivary duct, but the third affecting more the tip of the tongue, demonstrated how futile this common idea is, for this third vesicle was situated altogether out of the course of the ducts. These vesicles are merely accidental ; they are stationary, which they would not be if they were dilatations of the duct ; they pour out no more fluid, than what the vesicle itself contains, which would not be so if they were connected with the salivary gland ; upon being punctured they rise again in a week to their original size : this had been so punctured, and had returned three successive times. A more singular appearance cannot be seen than such a pure and pellucid vesicle, projecting from the red and moist surface of the tongue ; it is harmless, and seldom in child or adult exceeds the size or the proportion, at least, which I have represented in this sketch ; it is stationary, for I have seen it continue in children, or in young

people, for years, without harm ; when slit open, it leaves no sore, nor even a discernible mark, but in a week it is just what it was before : I have found no way of ridding the patient of this, which, in a child, is but an inconveniency, but in an infant prevents sucking, but to transfix the vesicle with a little hook and cut it freely out with scissars.

A proper tumour of a salivary gland is more frequent in the adult, and is a truly formidable disease ; for the salivary glands are inclosed by the muscles of the throat and tongue, the sublingual gland especially, which lies under the tongue, is covered by the *genio-glossi* and *hyo-glossi* muscles, it is thence so invested with thick masses of flesh, and so compressed, that, when it falls into disease, the collected fluid, unless it should be pus, cannot make its way through so great a thickness of parts ; it continues for years, and, if idly punctured, without any care being taken to obliterate the sac, or distended part of the gland, repeated distention of it, accompanied with inflammation, so thickens the root or vascular part of the gland, that it grows into a solid tumour, sometimes fatal, by compressing the throat and tongue. Misconduct in not distinguishing such tumours, in not obliterating very carefully the cavity of all sacculated tumours of the neck, and in not preventing the formation of firm and indissoluble roots, or bases, is an error so very frequent that I think I cannot do you a greater kindness, than to lay before you a few examples as documents.

“ Margaret Murray, a woman about fifty years of age, had crawled from one of the miserable Edinburgh closes into the Infirmary, asthmatic and suffocating, with one of the most formidable and bulky tumours I had ever seen ; it resembled that of Jenny Brown in situation and nearly in size, but its nature was altogether different. Hers was throughout of a stony hardness ; this, though of a degree of hardness resembling a cartilage, was hard only on its surface, while there was within an obscure fluctuation, which determined my opinion both of its nature, and of what should be done. The tumour was as big as the patient's head, it stuck close under the jaw, and so compressed the throat that the poor creature lay gasping for breath ; the least necessary motion in putting out her hands, or struggling to raise herself, threatened suffocation ; her eyes were staring, her nostrils widely dilated, and her hands grasping every thing near her as if for help ; her friends supported her perpetually in the recumbent posture ; her face was livid, and the lips purple with stagnant blood ; the tumour itself was universally lurid, or of a deep purple cast, as if verging towards gangrene ; and indeed I doubt not if it had been possible for the woman to have survived in this condition, it must have fall-



en into gangrene ; it seemed so solid withal, that the surgeon was doubtful what should be done, and refused to puncture it. My importunate representations at length prevailed, and, at an irregular hour, and in no very regular way, it was punctured ; a trocar too small for such a purpose, was plunged into the tumour ; the matter which flowed was thick and ropy, like that which is most frequently discharged from a diseased ovarium ; it resembled sago made with port wine ; about two pounds flowed without any sensible diminution of the tumour. It was expected, that this first discharge, and the thinner gluten which afterwards flowed, would give relief ; but those who indulged such an expectation did not recollect, that to produce a secretion so profuse, a great mass of vascular substance is required ; and the consequence of permitting a gelatinous collection of matter to attain to such a size is, that the vessels by which it is secreted, not being, as in a case of suppuration, ulcerated or destroyed, the stool or basis, consisting of those vessels, is consolidated into a tumour ; there is a sac indeed, which may be emptied, but there is also a stool or nucleus to that sac which cannot be discussed, which indurates more and more, and actually increases in size as soon as the sac is emptied, and the surface exposed to ulceration : thus the stool of a fluid tumour becomes itself a solid one ; and I have seen the imprudent treatment of such a sac establish a solid tumour, so large as to impede the motions of the jaw, and threaten suffocation, yet too intimately connected with the great vessels and nerves to be extirpated. So it was in this poor woman ; there was no diminution of the tumour, not even a temporary relief from the suffocation, though the matter continued, while she survived, to run from the opening, thin and pellucid like saliva. She lay reclined, always struggling for breath, and sometimes attacked with violent asthmatic paroxysms ; the jaws almost entirely closed ; the mouth continually open : the nostrils dilated ; and the stupor, which such difficulty of breathing causes, increasing every moment, and her swallowing being equally difficult with her breathing, she expired in the fourth week."

Timid and irresolute sentiments on the part of the surgeon, often bring the patient into those desperate circumstances : one surgeon confidently and sensibly advises that a tumour should be unrelentingly opened ; affirms that an incision, since it is instantaneously performed, cannot be much more painful than a puncture which is but a momentary pain, and protests that, by incision is the only way in which the sac can be obliterated, and a tumour, more formidable by being more solid than the first, prevented from growing : another surgeon contends, that, in a sac containing merely a fluid, a puncture will suffice ; this

opinion is too flattering to the little fears of a patient, not to be received ; the puncture is made, and the patient becomes the more credulous, since the tumour disappears ; but it returns again, and is again punctured, till, in the course of a few months of expectation, and, after various trivial operations of this nature, the basis, probably the body of the gland itself, is hardened into a solid tumour, and then not even that operation, which would have succeeded at first, not even the slitting it open and ulcerating with escharotics, whatever surface still remains, will prevent its continued growth.

Though I find salivary tumours usually filled with a pellucid, gelatinous fluid, I have found them not unfrequently filled with a mixed matter, resembling honey, or rather resembling mustard, and consisting of a tenacious, gelatinous matter, mixed with grains and lumps of a bright yellow colour, and an intolerable smell. I have taken notes of one case of this nature in a young woman from Berwick, whose native peculiarity of accent, had got a singular aggravation, by such an uncouth obliquity and imperfect motion of the tongue, as conveyed the notion of her attempting to chew, and turn each vocable with her tongue before she proceeded to swallow it, in place of uttering it. This was produced by a tumour of very great size, and of a character so peculiar as plainly to denote its nature : it consisted in a vast collection of matter in the sub-lingual gland, and as that gland is covered by the whole thickness of the tongue within, and by the mylo-hyoidei muscles without, and bounded by the line of the jaw-bone, it had the following singularities of character : it could not be distinguished as a tumour, but had rather the appearance of a general swelling of the lower part of the face, jaw, and neck, such as often accompanies severe tooth-ache or mumps : upon laying the hand upon the outside of the neck, below the lower jaw-bone, the whole hand was filled with a swelling, apparently solid, but so little convex or circumscribed, as to resemble in no degree the tumour of any particular gland ; and yet so limited and so firm, as not at all to resemble the general tumefaction proceeding from tooth-ache. Upon introducing the finger into the mouth, you found the tongue raised, turned edge-uppermost, and pressed entirely towards the left side of the mouth, the external tumour being in the right side ; upon pressing the fingers very firmly down by the side of the tongue, and re-acting from without, you could sensibly perceive, not so properly a fluctuation as an elasticity, which implied the presence of a fluid ; the tumour seemed elastic, like a foot-ball, but with a degree of tension which made it seem almost solid. It was by comparing a variety of circumstances, especially the original place and slow growth of

this tumour, that I confidently referred it to the sub-lingual gland; in this I had the advantage of the surgeon under whose particular care she was, but I did him the justice to send her back to him again and again, expressing my opinion, and my wish at the same time, that he should do whatever he might imagine right. By good fortune she called upon me the day she was to return home, nothing being as yet done to the tumour, but supplied with abundance of blisters and plasters to apply at a fit opportunity to her throat: I felt now that professional ceremonies should give way to essential charities: I placed her in a chair, and almost without her consciousness, at least before she was aware, struck a fine bleeding lancet deep into the tumour by the side of the frenulum linguæ, where, from the firm compression of the surrounding parts, the matter, though too gross to pass freely through such an opening, was spewed out from the orifice in a manner expressly resembling that, in which yellow paint is squeezed out from the bladder upon a painter's palette. It was of a deep saffron colour, thicker than mustard, mixed like gruel with seed-like particles, and extremely fetid. I knew that the tumour was not emptied, though the outward swelling was almost gone; but I also knew, that, even though I should not enlarge the opening, the second secretion from the surface of the sac, which is in all cases thin, would dilute and wash out whatever viscid matter remained; and, when she saw how suddenly my prognostic was fulfilled, she expressed a perfect confidence in whatever I predicted, and a perfect willingness to submit cheerfully to whatever I proposed to do. Next day I introduced the point of the probe-bistoury into the orifice made by the lancet, and knowing that the lingual artery lies on a lower level, imbedded among the muscles, and running along the lower surface of this tumour, while I had over the point and blade of my bistoury nothing but the inside membrane of the mouth much thickened, I ran it fearlessly, and at one stroke, as the less painful way, along the whole length of the tumour, when the thickest of the yellow mucus flowed freely, or was raked out with the points of the fingers, and the handle of the bistoury; and the tongue descending now to its natural level, was in a capacity once more of delivering the peculiar dialect of her native city in all its purity.

So tense and apparently solid was this tumour, in consequence of the compression of so many surrounding muscles, that her surgeon mistook it for a solid and strumous swelling. I reckoned that in this, as in all cases of sacculated tumour, the second secretion, which is thinner, would wash out the thicker mucus, and I was not deceived, but she left me too



early for me to witness the obliteration of this sac. I find it in all such cases a matter of some importance, especially in a girl, to anticipate the outward suppuration of any sacculated tumour, by puncturing it, though to a great depth within the mouth, and under the tongue, and equally necessary, to be at pains in preserving the opening, and obliterating the sac; a slight misconduct in this respect, occasions much distress to the patient, and much superfluous labour to the surgeon; among the examples of this which I have had occasion to remark, the following is the most instructive.

“Peggy Hall was affected with a tumour which, in all its stages, and for a course of three years, was ill understood, and worse treated: it was of a great size, sacculated, and its contents were fluid. She was a stout and lusty girl about twenty-two years of age; the tumour occupied all the left side of the neck, from the lobe of the ear and angle of the jaw, quite to the sternum, displacing the mastoid muscle. This, like the tumour of Jenny Brown, arose from that slight inflammation, which follows the extraction of a tooth. More than two years ago, after being distracted with tooth-ache, she had two corrupted teeth pulled from the lower jaw, and she distinctly remembers, that, two days after the extraction of the second tooth, she was sensible, upon undoing the flannels in which her swollen and inflamed face had been for some time wrapped up, that there was a little lump, about the size of a small plumb; it lay under the angle of the jaw, and has never ceased to grow, and has now, without the slightest pain or change of colour, attained its present size.

“In the month of April, 1799, she was directed to apply some kind of plaster; in the month of May, she was advised by Dr. Munro to have it opened; in a few weeks after, this was attempted by the surgeon of the village in which she lives, who made a large incision, but being soon alarmed, he laid aside the knife and lancet, and prosecuted his work rather by boring than by cutting; he tried with probes and directories to make good his way into the sac, but, having pushed them very deep, and toiled half an hour in vain, he abandoned his purpose: the scar of this ill-concerted operation, remains on the face of the tumour. The certain conviction that a respectable surgeon did, three months before we saw it, dig to a considerable depth, without finding matter; the manifest proof of his good will to reach it in this large scar left after his operation, and the firm adhesions under it of the skin to the mastoid muscle; the difficulty too, of distinguishing fluctuation in a very tense sac, made more tense by the general construction of the platysma myoides, and the strong pressure of the great mas-

toid muscle, was enough to disconcert us, and impress a belief that this tumour could not be of a fluid nature, and indeed these considerations induced almost every surgeon who had a share in the consultation to pronounce, that the tumour contained no matter, and should not be punctured. But to decide thus is to forfeit the natural advantages of our own skill, and indeed is little better than yielding our own deliberate judgment in favour of the opinion of a man plainly ignorant and awkward : so far from trusting any thing to his judgment, or believing that he miscarried, only because the tumour was solid and not fluid, I think it no difficult matter to demonstrate the kind of awkwardness, which made him miscarry in his operations.

“ The tumour is distinctly, to my apprehension, a great sac of fluid secretion: there is nothing doubtful in the case : this sac lies under the platysma-myoides, and under and before the mastoid muscle ; the belly of the mastoid, being raised upon the bag or tumour, feels soft and flaccid, and might have seemed to an unskilful surgeon, to form a part of the tumour ; by making his incisions over the belly of the muscle, he could not penetrate to the sac otherwise than through the body of the mastoid muscle ; having cut to a considerable depth among solid and quivering flesh, he became alarmed ; willing still to penetrate farther, and yet without danger, he bored with his finger, cut a little obliquely with his knife, and bored a little more with his directory, till having buried it apparently in the tumour to the depth of three or four inches, he believed, and to the ignorant relations and patient, seemed to prove, that there was no fluid in the tumour, while there was nothing singular in all this but his own awkwardness : he had penetrated entirely under the belly of the mastoid muscle, pushing his probes obliquely betwixt it and the sac ; to avoid the great vessels of the neck, he wrought obliquely backwards ; by cutting obliquely backwards, he made good his way under the belly of the mastoid muscle. The young woman endured the disappointment, and suffered the tumour still to extend, not without great inconvenience and deformity, for seven or eight months : the operation being then performed more correctly and confidently, every circumstance tended to confirm the notions I had formed of this awkward proceeding : the surgeon who now operated was timid in his manner of performing the operation, and careless in conducting the cure. The incision through the skin only was freely made ; the incisions through the platysma myoides were made timidly, the flesh of its fibres retracting and quivering as they were cut : the sac then burst from betwixt the divided fibres of the muscle, white and transparent. I could almost distinguish the fluid through it ; and this hy-

drocele-like sac being cut, several pounds of thin serous fluid gushed out: then the long iron probe was passed across the cavity of the tumour; and its point cut upon at the anterior edge of the mastoid muscle; in short, near the place of the former incisions: whereas, to lie across the tumour, the point should have been cut out behind the belly of the mastoid, and then the seton or cord would have more effectually inflamed the sac, and obliterated the cavity.

If these sacculated and solid tumours of the neck and jaws are interesting from their frequency, there are others still more so from their danger: they are carefully to be distinguished from other tumours, especially from those of an aneurismal and varicose nature; and I especially request you to remember, that, of the tumours which occupy the fore-part of the trachea, and are connected with the vascular system of the thyroid gland, a great proportion are venous: aneurism of the carotid artery is indeed so rare a disease, that it is not certainly known whether such a disease exists, it absolutely is not understood how or from what causes the patient dies.\*

The profuse plêxus of inosculating veins about the angle of the jaw, and the corresponding branches of the maxillary and facial arteries, are frequently thus diseased, and still more frequently the veins and arteries of the thyroid gland, whose trunks, as they run down the fore-part of the neck, are dilated; and form a conspicuous part of the tumour. Jean Bryce has a tumour of this nature, growing from her early years, which, like those occurring in the skin, the lip, the eye-lids, the rectum, &c. began in a very small tumour, having nothing peculiar in its form: it began when she was a little girl, has been waxing gradually larger for these thirteen years, and seems to me almost purely an enlargement of the vessels and cellular substance of the thyroid gland. It is difficult, in describing such a tumour, to distinguish the sensations conveyed by the touch and by the eye, from those conjectures which imagination presents to us in handling the tumour. The marks I have

\* I saw a young woman, not 24 years of age, die of this disease, in the sixth week after the dilatation of the artery began. She had a cough and quickened pulse, and her disorder was mistaken for a cold: she had great difficulty of swallowing, and it was mistaken for the effect of sore throat and swelling of the glands: she had a constant stupor, and it was ascribed to fever: but the compression of so large a tumour, lodged close upon the trachea, and braced down upon it by all the strong muscles of the throat, and compressed too by the jaw-bone, could not fail to excite at once difficult deglutition, dyspnœa, and stupor, and these were the symptoms of which she died.†

† There is now at least no doubt of the existence of this disease: Mr. Astley Cooper has operated twice for it, once with complete success, in the other case the patient died, but not from the operation. S.



taken in my case-book are of a mixed nature ; they are these ; the tumour was in its early stage small, knuckle-like, but soft, round, moveable, and without pulsation : whatever its nature may have been at the first, the structure of the part is now entirely changed ; the tumour is now large, soft, spongy, and spreads equally on each side of the throat, filling the whole neck, and occupying expressly the place of the thyroid gland : though soft, it rolls loose under the skin, is moveable also in respect to the muscles and internal parts, and may, on each side, be worked backwards under the mastoid muscle, especially towards the right side of the neck, where the tumour seems more condensed : it suffers a general subsultus, or shock, from each stroke of the carotid arteries, but it has also a particular and distinct pulsation within itself, which, though never intermitted, is yet more sensibly felt when the blood contained within it is repressed through the veins into the general course of the circulation ; for, while the cells of the tumour fill again, the blood seems, at first, to ooze or pour insensibly into the tumour, but, when it is a little filled, the stroke of the arteries which are filling it begins to be felt, and, as it fills, the pulsation strengthens still, being completely injected and become tense, there is a deep and strong throbbing in every part of the mass : in this particular case, there is much accumulation of solid matter, i. e. of thickened vessels and cellular substance, besides the mass of circulating blood : the proportion of both can be distinctly perceived, for, by handling, and squeezing the tumour, and repressing the blood, it can be so much of it repressed into the veins, as to diminish its size by two thirds ; but no force can repress it entirely, as in smaller tumours, or in varicose aneurisms. When the blood is repressed, the loose doughy feeling of cellular substance and dilated veins is more sensibly felt, and is perceived to form the chief mass, and especially the basis of the tumour : when the blood is thus repressed, you can distinguish, by pinching strongly, a thick and solid sac within the skin, and quite unconnected with it. Besides the other intimations of its connection with the thyroid gland, and the whole vessels and substance of the throat, I can plainly distinguish the thyroid arteries running long and tortuous over the sides of the tumour,\* as if they descended from under the chin, and then spread over the sac, (so far are these arteries displaced from their natural course) they divide, upon the surface of the tumour, into lesser, yet very perceptible twigs, then dive into its substance, and lose themselves ; while

\* The thyroid arteries were, even in their lesser branches, dilated to the size of the temporal arteries.

the external jugular veins, dilated both in their trunks and branches, run tortuous over its surface, especially down the middle of the neck.

The whole tumour, when voided of blood by continued pressure, has the puffy feeling of varicose and dilated veins; when distended by the reflux of blood, it has the firm elasticity of a sac full of some fluid, dense as the blood is, and having firm and fleshy walls.

These are the characters of a tumour which is to be avoided any where, but in the neck most of all: which might indeed have been extirpated in its early growth when circumscribed, small, soft, and not pulsating, by laying open this part of the neck fairly, by dissecting cautiously round the tumour, and tying its root; but now the disease has, by carrying the dilatation of veins, arteries, and cellular substance, deep into the substance of the neck, become too formidable to be dissected out. The laying open the neck for the extirpation of so slender a tumour in a little girl of ten years of age, must have seemed harsh to parents, had it been proposed; but how just the prognostic of the surgeon is, when he advises such an operation, never is known till years have elapsed, and the case is desperate. This girl, after enjoying a respite, not without frequent alarms, is doomed, in a few years hence, to feel the consequences of neglecting such a tumour in its early stage: the disease tends, according to my apprehension, to spread inwardly, and the first hæmorrhages will be into the trachea or throat.\*

In another case the form of the tumour was still more circumscribed, and corresponded more perfectly with the description formerly given of this disease: it is similar to the preceding case in having begun from the girl's early years, and increased till now that she seems about 28 years of age; in having a lively and strong pulsation; in having a thick and spongy basis, seated on the jaw-bone, extending into the substance of the cheek, and over the chin into the substance of the neck and throat; in having this stool or basis less compressible, yet plainly filled with circulating blood, while the central parts of the tumour are more distinctly sacculated, consisting of a wider spongy substance of large cells, or of something like a proper sac, from which the blood can be entirely squeezed out by pressure. But it differs in being superficial, in be-

\* The thyroid gland has been successfully extirpated by Dessel. In doing it, which is exceedingly difficult, and should not be attempted, except by a most accurate anatomist, and dextrous and intrepid operator, the four thyroideal arteries must be tied before they are cut, and the principal part of the dissection must be done with the handle of the scalpel. S.

ing cutaneous, or almost so, in having thin walls, and a red colour, deepening into a purple at those points from which the blood bursts out: large dilated veins, two or three especially like venous trunks, descended from the central parts of the tumour, into the veins of the neck, while the thick and fleshy basis of this tumour so encircles the jaw-bone, enters so deeply into the substance of the cheek, and joins so solidly the neck to the jaw-bone, that, though this girl's life were the most valuable, (she is like many I have observed who have these imperfections, an idiot) and her circumstances the most desperate, I hardly know how it could be extirpated, since there is no way of effectually extirpating such tumours but by leaving not the slightest part of the diseased substance behind.

But pulsation is not an essential, nor inseparable characteristic of such tumours, and it is my duty both to give you notice of this fact, and to acknowledge, with that generous temper which becomes one discoursing on matters of life and death, whatever errors or mistakes I recollect in my own opinions or practice. I was consulted for a tumour of this kind in a young woman (also an idiot) about 24 years of age, big, lusty, and otherwise in perfect health; but being accompanied by no friends, I could learn nothing of the history of her disease. Her neck was fleshy and fat, her cheek round and full, her features large and masculine, and, behind the angle of the jaw, was seated a tumour of this singular character: the skin was thick and sound, and altogether unconnected with the tumour; the tumour was conical, and occupied exactly the triangular hollow behind the corner of the jaw, but it was a tumour which we could not say it was either very soft, or very elastic, receded like a loose, puffy, and unconstricted hernia, upon the slightest pressure: when it receded, you could pinch up a distinct and thick sac, which held not the slightest communion with the skin, or its system of vessels: the contents of this sac could be almost dissipated by pressure, and no solid nor spongy basis could be felt at the deepest part of this sac, nor could the slightest degree of pulsation, or whizzing noise be perceived, when the fluid returned into the sac. The case so entirely resembled that of Peggy Hall, viz. a seemingly thin and serous matter, contained within a large and flaccid sac, that I entirely believed so. Although the characteristic of the almost total receding of the fluid was too marked, and particular, not to have excited strong suspicions; yet, in opposition to Mr. Russel, and several respectable and judicious surgeons, I believed that it contained matter, and was confident, at all events, that there was no shadow of danger in making the experiment of puncturing the tumour; in opposition to their better judgment, I made a



slight incision through the skin, and, with the point of a bleeding-lancet, punctured the sac, and found that it contained actually blood, which seemed to ooze out into the sac, from innumerable small vessels, had no arterial pulsation, and no distinct character by colour or otherwise of being venous or arterial blood; it had so little impulse, as to make not the slightest sugillation of the neck, at the place where the puncture was made, and healed like a vein opened in bleeding. I take a pleasure in mentioning this, both as it ascertains that often the sac is of great extent, and the transit of the blood from the arteries to the veins through the cells very slow; that the tumour may be large, and truly an aneurism from anastomosis, without being characterized by pulsation; and also as this little narrative may prove a warning to you, for the blood might have been difficult to restrain, and the wound difficult to heal.

As I always reckon a case more useful in proportion as it approaches the more ordinary occurrences of practice, and sacculated tumours on the throat containing blood are so frequent, and require such careful treatment, that I will occupy a small portion of your time in laying an example before you.

Miss A—— came from a distant part of the country, with a tumour encircling the whole throat, from ear to ear almost, and extending from the chin to the sternum. This tumour, the growth of several years, could not be a suppuration of the thyroid gland, for there had been from the first no induration nor inflammation, but a sac containing a secreted fluid, increasing slowly in quantity, till the tumour covered all the trachea. This, like every other great sac, was far from being tense, it could be pinched up with the finger and thumb, so as to make the uncommon thickness of the sac very sensible to the feeling, and the fluid so distinctly fluctuated, and so easily from side to side of the tumour, as to convey the impression of its being like that of Peggy Hall, of a thin and serous nature; nor was there any other reason, except the peculiar seat of the tumour, to doubt of its being serum, or to apprehend that a tumour so old, and forming so slowly, could contain blood.

In the choice of means for obliterating so large a sac, occupying in a young lady the whole circle of the throat, it is most natural to incline to those methods, which, if successful, are least liable to produce either a scar, or unsightly thickening, or any other deformity: but, in the present case, I could not but prefer the most decisive method of proceeding, to those which seemed milder, for the following reasons. The flaccid state of the tumour was such as permitted me easily to pinch up the sac, and feel most sensibly that its walls were peculiarly

thick and fleshy : I foresaw that if such means only were resorted to as tend to obliterate the sac slowly, and by successive paroxysms of inflammation, the muscular fascia of the neck, the platysma-myoides, would be united by adhesion to this thick and fleshy sac : I feared that if the walls thus constituted were kept long in an inflamed state, irritated, and thickening, the thyroid gland would not entirely escape, but become inflamed and hard, so as to form a solid basis for the tumour ; and I could not but recollect how much more apt the thyroid gland is to swell in the female sex : for these and various reasons, especially from my patient's intention of returning home, I proposed that method which, though it may be blamed as the most cruel, is often in truth the most lenient, by being the most effectual ; I mean the passing a seton or syndon across the sac : but, from that timidity which carries with it such strong apologies, the method I proposed was unfortunately declined, and that of a simple puncture preferred.

Having called Dr. Monro into consultation, the propriety of opening the sac was decided on, from these motives ; first, the certainty of the sac continually increasing in size, deforming the neck more and more, and, perhaps in the end, corrupting the cartilages of the larynx, and making its way into the trachea, and forming there such irregular suppurations, and incurable fistulas, as often prove fatal. Secondly, that there is no kind of motive for refraining from this very necessary act of duty, since the fluctuation is distinct, the sac circumscribed, the fluid not repressible ; no varicose veins occupying its surface, no pulsation felt from within its substance, to make us fear its being supplied by any remarkable arteries.

It appeared to us that, if there was blood in the tumour, or hæmorrhagy in the operation, it could be only such as might distil gradually from the surface of so firm a sac, not such active hæmorrhagy as might endanger life, or prevent the suppuration of the cavity.\*

Upon making an incision through the skin and fascia of the lower part of the neck, and striking the lancet directly into the tumour, a thin bloody serum ran out, or rather pure blood, for it coagulated in the saucers, even before it could be turned from them into the basin : it expressly resembled that thin bloody secretion, which I have so often seen run out upon making openings round the knee-joint, or in swellings when, in consequence of a shock or rude blow, blood of this dilute

\* The opinion and descriptions are extracted from my case-book ; the other circumstances of the case are not from recollection, which I never trust to, but from letters and memorandums.

and serous nature is effused, as from the shock of riding against the pole of a carriage, &c. or in consequence of high and sudden inflammation ; even after strains of the muscles without any external injury, I have seen such effusions of blood, and shall have occasion to relate some fatal cases of this nature.

In the evening when the plug was withdrawn, the same thin bloody serum, instantaneously coagulating, flowed from the sac ; and at each dressing, during the first four days, the fluid which was discharged seemed little different from pure blood ; it was plainly a sort of secretion from the thick walls of the tumour, it gradually became less coagulable, then very thin and whitish, and ripened before the tenth day into pure and well conditioned pus, importing, that the internal surface of the sac was in a state of suppuration, and inclined to heal.

Now the time of my patient's departure approached, and the seton or long skein of cotton by which the sac was to be kept inflamed till obliterated, and the sponge with which the opening was to be preserved, had been long used, and those who were in future to manage them made familiar with their use. The former was lodged deep, and within the sac by the long probe ; and the latter had been gradually enlarged so as rather to dilate the opening in proportion as the cavity of the sac lessened ; the Gentleman who was to be intrusted with this part of the process was a party at each dressing, and I had no fear that all would go well : but my first letter from the country announced that the matter was foul, bloody, and fetid ; the flow of it obstructed by fungus, almost closing the orifice ; that the introduction of the sponge was become difficult, or almost impossible ; and that advice was expected of me, which really could be of no avail without either my personal presence, or my patient returning to town. I was sensible that now the means I recommended must be resorted to, for, (although it was not included in the description of all that was wrong,) I was sensible that there must be a great thickening of the neck and throat, from the induration of the sac : I found that much pressure and thumbing of the parts was necessary to discharge the matter, and that she had suffered from attacks of fever, accompanied with pain and swelling of the tumour.

By good fortune I was called into that part of the country, and found when I visited this lady, the whole tumour condensed into a thick spongy mass, inflamed over the whole surface, and spongy in its substance, in consequence of continual torturing and squeezing, while pieces of the sponge tent were suspected to lie buried in it : I actually encountered these lost pieces of sponge with the probe, and hooked them out : enlarged the lower opening, passed the long iron probe obliquely across



the throat to the upper part of the tumour, and examined how I might best cut it out : but this I found a more difficult and delicate operation than I had imagined, for the upper part of the sac lay under the left lobe of the thyroid gland, entirely under it, so that a considerable thickness of parts was interposed betwixt the probe and the skin, and it seemed impossible to cut out the probe without wounding the thyroid gland and some of its arteries. The best I could hope was by circumspection not to cut a large one, I therefore felt long and circumspectly round the point of the probe, made an incision through the skin only, such as admitted the point of my finger, and with that feeling the mass of the thyroid gland, and being sensible that no large artery was under my finger, I dissected through it. The bleeding was so violent and alarming that my assistant, a medical Gentleman inured for forty years to all variety of practice, fainted, and forsook me. I could not go on to open the sac, for that would have left me without any surface to press against, or cut upon, if I should need to open the skin more widely, and take up an artery ; and had I opened the sac, the blood would have been admitted to its cavity : laying therefore a piece of sponge into the incision, and pressing it down with the thumb, I allowed some time to elapse, and the hæmorrhagy ceased, so that I was enabled, in half an hour, to proceed and cut out the probe : having passed it I drew a coarse big seton across the sac, and left it there with careful instructions how to use it, viz. by carefully shifting and replacing the cord ; by applying poultices outwardly, and slightly astringent injections inwardly, according to the state of the parts : thus from a mistaken lenity the cruelty was still to do, and the thickening and deformity fixed and irremediable.

Recollect then in your future practice, that a tumour hard at first, and gradually softening into fluctuation, must contain matter more or less mature ; but that a tumour soft, even when very small, gradually enlarging, and having no stool, or basis, may contain blood : that a tumour of this last description, seated on the fore-part of the neck, often does contain blood, though it is neither varicose, nor pulsating : beware then to make no rash opening without making this prognostic, that the tumour may contain blood not matter.

Believe me, gentlemen, I am incapable of magnifying by the manner of my narrative any such trivial difficulties, as this of the thyroid gland and its system of vessels, being interposed betwixt the knife and the probe ; I mention these occurrences as lessons concerning little points of practice, which, without experience, you could never learn, and which indeed without careful notes of the trivial perplexities of the hour of visit, I should not have remembered to teach you.

But to return to subjects still more interesting: you will have observed that I speak of erosion and caries of the cartilages of the larynx, as producing very dismal consequences, and as far from being unfrequent, and that I allude to the possibility of blood or matter penetrating through the walls of a suppurating or sacculated tumour into the throat; and when this happens, the complicated functions of the throat, in breathing, swallowing, and speaking, produce a strange variety of suffering. I have remarked in practice several stages of danger and suffering, which I think it desirable you should be acquainted with: first, the suppuration which I am now going to describe, seems to me of a scrophulous nature; it begins without any sensible inflammation, it ripens insensibly, and extends, and displaces the trachea, and œsophagus, without pain or any other disorder, except difficulty of deglutition; it grows so very slowly, that the patient is no way alarmed, and the surgeon is not at first conscious of all the dangers of his situation. When first the surgeon's attention is called to the tumour, it has very generally attained to a great size, at once compressing the throat, and bulging out the neck: a diffused tumour is observed towards the lower part of the neck, below the place of the larynx, approaching nearer to the clavicle than the throat, occupying the interstices of the muscles, and capable, like a hernia, of being repressed behind the mastoid: the fluctuation of the matter is obscure, when the surgeon feels for it in the neck only; but when he looks into the throat, he distinctly perceives a soft, uniform tumour, pressing the tonsil and root of the tongue towards the opposite side, intruding upon the throat, obstructing the breathing much, but still more the deglutition: he is sensible that this is the upper part of that sac, which protrudes in the neck below; by pushing his fingers into that side of the throat, he feels the softness and fluctuation of the matter contained within a large and flaccid sac; and by tapping below, and feeling or looking at the same time into the throat, he is sensible that it is one great abscess occupying all the neck, lying deep under the muscles, in the direction of the œsophagus, and what is more dangerous still, of the trachea; and, if he is as conscious as he should be of this danger, and as clear as these signs should make him of the extent and place of the abscess, he with his scalpel cuts through the skin in the lower part of the neck, dissects till he feels distinctly the sac and the fluctuation, and then plunging his knife or lancet into it, prevents the sad consequences of its bursting into the throat, by this timely opening in a dependent point; by the pressure of the muscles, which, every time they turn the neck, or move the throat, press the sides of the sac in contact, it is obliterated though slowly,

and the judicious use of injections and of syndons contributes greatly to the cure. I have more than once seen the throat surrounded on every side with these baggy abscesses, occupying the space under the angle of the jaw, and the two sides of the neck irregularly, so as to require incisions which it yet is always unpleasant to make: nor should the surgeon ever allow himself to make such incisions without that declaration, which may be so necessary to his own good repute, viz. that it is not impossible the tumour may already have communication with the trachea, or that air may issue along with the matter; for often the abscess bursts in the throat with an opening so small, and of so valvular a form, that the abscess imperfectly discharged of its contents, maintains its original form and size, while the slow issue of the matter from it only excites a slight and occasional cough.

Secondly.—I have said the patient feels no pain, and the surgeon is unconscious of danger, when an abscess thus occupying the neck threatens to burst into the throat: the danger indeed is of a nature, which practice only, and not theory, could enable you to predict. While the disorder has not reached the throat, its effects cannot be imagined, so entirely is the simple abscess free from harm, or the appearance of harm, the displacement of the trachea, the uneasy bulkiness of the throat, and the difficulty of breathing and swallowing excepted: nor is it upon its first bursting into the pharynx that the ill effects of it are perceived; I remember one coarse country-fellow, in whom two large scrophulous abscesses of this complexion had burst into the pharynx, but except a hoarse uncouth voice, and difficulty of swallowing, he had as yet no symptom which was not rather ludicrous than dangerous; for you distinguished the connection of these abscesses with the throat, not by seeing any openings internally, or knowing by any mark that matter was discharged into the throat; but by the fellow blowing up the two bags at will, till they resembled the alforges of a baboon, and really when this resemblance struck you, you could hardly, on looking at his ill shaved, grinning muzzle, think them at all misplaced. By making free openings on each side, and washing and cleaning the sacs, they were consolidated.

But when such abscess lies deep behind the throat, betwixt the vertebræ and the pharynx; when it is not sensible, nor can be opened outwardly, and ulcerates and bursts within, a sac is formed, accompanied with a ruinous disorder of the structure and function of the part. Even before the abscess bursts into the throat, the larynx, or cartilaginous and only solid part of the throat, is pressed strongly over to the opposite side; the arches of the palate betwixt which (i. e. betwixt the anterior



and posterior arch) the tonsil of each side is lodged, are so pressed together as to adhere ; the secreting surface of the tonsil is thus sealed up, and covered over by the adhesion, as if it had never been, and the membrane of the throat becomes flat and shining, its natural plies are obliterated, and the whole is smoothed into one level surface, till new constrictions and diseased folds and ridges are formed.

Thus, by the very first adhesions, the throat is straitened ; often the arches of the palate are so fixed down by adhesions, that the whole opening from the throat towards the nostrils is closed up, or is almost closed, leaving a small slit-like opening, like the slit in a poors'-box. Now there is a perpetual regurgitation of the food and drink, suffocation, so that the eyes stare in the head, accompanying every attempt to swallow : the air is admitted into the abscess, and the matter into the trachea : the tickling cough is incessant, the expectoration endless, the fits of real asthma very frequent. The admission of the air and food into the abscess mixing with the pus, gives a pestilent fœtor to the breath ; and those functions of speaking, breathing, swallowing, which go on in the natural state of the parts without consciousness, or any sensible efforts, are now a perpetual struggle, and if the patient can at all survive, it is by being careful to swallow little drops of fluid, and little morsels of nourishment, with that caution which is absolutely necessary to prevent suffocation, which yet often fails, and then severe struggles and suffocation come on.

During the progress of the disease, the thin matter of the abscess is streaming into the trachea, while the coughing and straining supports a perpetual state of ulceration : the whole inside membrane of the throat is thickened ; that glandular surface surrounding the root of the epiglottis, and named, from its natural aspect, *caro glandulosa*, is thickened and exulcerated ; the mouth of the glottis has its lips so thickened, that it is no longer flexible nor patent ; and the back of the pharynx, if it be not hidden by the adhesion of the arches of the palate, is ulcerated, grows fibrous and stringy, like the *chordæ tendinæ* of the heart ; the muscular strings which cross it in every direction are red, and ulcerated ; and the reticulated interstices, filled with pus, which you see sometimes oozing out from larger ulcerations and cavities. These are changes of structure, which occasion a very protracted scene of suffering ; the patient walks with his chin resting on his breast to relax the ulcerated throat ; his usual breathing is slow and difficult, accompanied with a lifting of the chest and shoulders, a raising of the eyelids, an anxious contraction of the features, and a hissing and stridulous noise ; he is perpetually clearing, or attempting to

clear the thickened and encumbered trachea coated with mucus, and this action is so incessant, that it seems necessary to his breathing at all. The voice is whispering, and when forced degenerates into a sort of screech: the arches of the palate, while they contract and close over the tonsils, adhere also to the Eustachian tubes, so that the hearing is almost lost, whence the patient, in conversing with you, always turns his head and lays his ear to hear you. His breathing is habitually difficult, so that the blood is driven into the head, and he passes much of the day and all the night in a lethargic stupor, each fit of anxious breathing being followed by oppressive head-ach, and increasing stupor. He rises during the night in asthmatic paroxysms, and exposing himself to an open window, finds a slight relief, and, returning again to bed, falls into an apoplectic stupor, from which, even at mid-day, he is roused with difficulty. At last, becoming truly apoplectic, he, in some unusual paroxysm of asthma, runs to the window, throws open his neck and breast, grasps at something for support, and, no longer able to sustain the struggle, he falls into a fit of stupor, his head drops forward, his limbs relax, and he falls down and is found dead. This is the dreadful conclusion of the scene where the slow thickening of the internal membrane of the throat, and especially the induration of the glottis, is the cause of his death.

Thirdly.—I know not whether this labouring and dreadful condition, much as I have sympathised with those who have died so, is the worst, for often the disorder is more complicated by big and capacious sacs of matter bursting into the throat; and the death of the patient, though less lingering, is more terrible. When a great abscess is permitted to undermine all the cellular substance of the throat, and surround the œsophagus, there are no limits to the number of openings: it bursts at various points into both œsophagus and larynx: the openings into the tube are as various and perplexing as those around a diseased urethra, and it is as difficult to find the true passage, so as to convey nourishment to the patient. The openings are large, oblique, and valve-like, and often surrounded with strings of indurated fibres, resembling the openings in the auricles of the heart: these mouths of the abscess are as large and open, to receive whatever fluid or solid the patient tries to swallow; the food and drink pass sometimes into the trachea, sometimes into the sacs, sometimes it regurgitates with great violence by the nostrils, going, in short, in every direction but down the natural passage, which being fleshy collapses, while the slits in the solid larynx, or cartilaginous part of the throat, present themselves to receive the morsel, or a part of it; and the bag, when distended by food, or drink, or air thus pressed into it by

the action of the throat, compresses the œsophagus. Where there is less of general ulceration and thickening of the membrane, and the sac compressing the œsophagus is large, the patient is rather starved than suffocated; he retains all his faculties, makes every effort to receive food, he falls into fits of suffocation only when he tries to drink, and actually dies of famine. His condition gives a greedy eager expression to his features, and a wild and hurried manner to all his actions; he wishes for food, yet knows he cannot swallow; he has an irresistible desire for drink, but, when he endeavours to pour it down, it is rejected by his nostrils: the struggle for breath continues long after each attempt to swallow, and shrinks up his features into a rigid grinning form; his shoulders are raised, his lean and skinny hands sprawling and extended, his visage is pale, and meagre, his nostrils dilated, his forehead wrinkled, high, his eye-balls staring from their hollow sockets, the angles of his mouth retracted, and the viscid saliva, which he has not power to swallow, distils in strings from his mouth. Such is the dreadful condition to which a patient is reduced by that ignorance and indifference to slighter signs of disorder, which are so common with the vulgar, or by the surgeon allowing, for fear of danger, any deep-seated abscess to burst thus into the throat.

Even after the tumour has burst into the throat, it is not too late to cure the abscess; it seems to me that a dependent opening will, by emptying the sac, prevent those disorders which only long continued ulceration and complicated openings occasion.\*

“James Ogilvy, a man of middle age, has a deep scrophulous abscess occupying the right side of the neck, displacing the trachea, and pointing in the throat: how long it may have existed he does not know, but six months ago it became very prominent, especially towards the lower part of the neck, affecting his breathing and swallowing, yet that very slightly, and accompanied with no sense of uneasiness nor pain: but soon after, however, the tumour appeared in the lower part of the neck, it became painful, and, about four months ago, the swelling began to be felt in the mouth; this stage of the distention was accompanied with violent pain. Since then the swelling has increased continually, though slowly; the swelling in the lower part of the neck is diffused, soft, and colourless; within the throat, in the fauces, it appears large, soft, fluctuating, equably convex, and apparently filling the whole of the pharynx; the pain is gone, but the respiration is affected, deglutition extremely diffi-

\* Should the tumour burst into the trachea by a large opening, suffocation would probably immediately take place. Should the matter make its way into the pharynx the patient might recover, but if it was discharged into the larynx he would most probably die. S.



cult, and the abscess is so tumid, that you would expect it to burst immediately, and widely, into the pharynx; indeed, although the abscess thus preserves its convexity, I cannot but be persuaded, that there is already a partial opening betwixt the horns of the os hyoides, and those of the thyroid cartilage, at a point where we cannot see the ulcer. I am persuaded of this from the incessant cough and perpetual discharge of matter: he has a hectic visage, and a fretful pulse, and the circumstances of the abscess admit of no delay.

"On the 25th of July this great abscess was opened by an incision in the lower part of the neck, and nearly three pounds of thick yellow pus were discharged. The neck flattened, the respiration and deglutition became easy, and the internal swelling, viz. that which appeared within the throat, disappeared: the abscess was carefully washed out with injections, and every care taken to keep the cavity of this enormous sac clean, and to support the patient's strength and prevent fever.

"But it rarely happens that so great an abscess is opened without hectic: the discharge was very profuse and thin; his pulse rose from 80 to 112, he complained of great weakness, and had night-sweats, while his skin was burning hot, and his tongue white: the fever continued with little abatement for ten days, for eight days more it continued increasing, so that his life seemed endangered, but as yet we were not conscious of any other cause than the great extent of this abscess and the profuse secretion of pus, when suddenly the abscess within the throat, which seemed to be emptied through the incision below, but had only subsided, burst into the pharynx; then his anodynes procured him rest, the bark sat pleasantly on his stomach, his food nourished him, his appetite and strength increased every day, the discharge which now became very moderate, sometimes almost ceased at the external opening, and then totally ceased from the abscess of the throat: at last, at the end of six weeks, he was permitted to retire to the country to live on milk and take gentle exercise, with every prospect of a perfect cure."

The condition of the poor creature, whose case I am now to describe, was wretched in the last degree. The only opening left betwixt the nostrils and the mouth, or top of the pharynx, is slit-like, and no bigger than to permit a farthing to pass into it edge-ways; the arches of the palate, and the velum palati, or soft and moveable palate, have both adhered so to the back of the pharynx as to seal down the tonsils, and the face of both tonsils is so covered by this adhesion, that even the place where the tonsils should be is not to be perceived; and the adhesion of the arches of the palate is so complete, as

to leave only this slit-like opening. This slit-like opening only was visible during life; for the ulcerated openings from the abscess into the pharynx, lay opposite to the glottis, and so far below the root of the tongue, as not to be seen, or even suspected in any other way, than by the catheter (when we attempted to pass it into the œsophagus) slipping into them: the mechanism of the throat was entirely ruined, and the larynx, irritable even in its healthy state, was kept in a perpetual irritation and struggle, in a state of asthmatic constriction at all times, and in a state of absolute strangulation upon the slightest attempt to swallow. The effects of every attempt to take down food or drink may be easily imagined, from the relation of the parts; for, first, the glottis and epiglottis, the parts which should be in perpetual motion to prevent accidents in swallowing, were stiffened by ulceration and thickening: secondly, the opening of the pharynx into the œsophagus by which the food should descend into the stomach, was distorted and obstructed, both by the pressure of the abscess behind, and by the cartilaginous part of the trachea, the larynx being drawn continually backwards by the stylo-hyoidei muscles, in the incessant spasms of the whole throat: thirdly, the valve-like openings of the abscess or abscesses, (for abscesses appeared during life to occupy both sides of the jaws and throat) presented themselves more directly than the openings of the œsophagus, receiving every morsel of food or drop of fluid. The mechanism of the throat was so changed, that the more violently the efforts to swallow food or nourishment were excited, the more effectually was the purpose defeated, for, when the whole force of the throat, tongue, and muscles of deglutition was exerted to force down the morsel, the œsophagus received not a particle of what was destined for the stomach, the whole force therefore of the muscles of deglutition was spent in injecting the sac of the abscess with the food or drink. The sac, large and capacious as it was, soon filled; and no sooner filled, than it effectually compressed the œsophagus; the food or drink ran over into the trachea, and, by the effort which this instantly excited, the contents of the bag, along with the last mouthful of the fluid, were rejected through the nose. It was in this condition, in this last stage of his malady, that I saw this wretched man: he was meagre and staring with famine, his belly clang to his back, his skin to his bones, his face was squalid, lean, and yellow, his voice hollow and rattling, his gray eyes sunk in their sockets, the eye-lids and skin of the forehead raised and wrinkled in deep furrows: whenever he moved he was in danger of suffocation: the slightest attempt to swallow was accompanied with a struggle, which he seemed hardly capable of surviving: his

skinny hands and sprawling lean fingers, were perpetually extended before him, as if ready to catch at something for support, when the strangulation came upon him: he had neither strength nor voice, to tell me the date nor the cause of his sufferings, and, though the abscesses on each side of his jaws, extending along the neck, varying in their state of fulness, and bulging upon every attempt to swallow, explained his condition in part, yet in honest truth I mistook, at first, the slit-like opening above mentioned for the way into the œsophagus, till I found that, in place of admitting the lithotomy staff which I used as a probe, to pass downwards into the pharynx, it only entered when turned with the point upwards towards the nostril. Satisfied and instructed in this point, and knowing part of the disorder, viz. that the arches of the palate had closed and adhered, I sought the passage downwards, and having passed the flexible catheter into the œsophagus, I poured down by the syringe a basin of warm beef-tea, the first meal he had enjoyed for a long while, and which he acknowledged to be very grateful. But neither this first operation, nor any subsequent one, was easy; I knew nothing precisely concerning the ulcerated openings leading into the sac; often when the catheter seemed to pass into the œsophagus, it plumped into the sac, its point was resisted, and it was only by its stopping short thus, that I was aware of the tube having missed the pharynx; upon such occasions I withdrew it to try again for the true passage: the catheter was always passed two or three times, before it actually entered the œsophagus; it was only when it passed easily and quite down into the throat, that I durst venture to pour in the soup; sometimes it went into the opening of the larynx, and, though instantly withdrawn, excited such a suffocation as was very alarming. I fear that the pupil to whom I entrusted the passing of the catheter, and the nourishment of the patient, had actually failed, and concealed his own awkwardness from me: I cannot but reflect with self-reproach on my own remissness in not passing the catheter regularly myself: but, I believe, this complicated disorder was quite incurable; the poor man grew more ghastly in the visage, and weaker every hour, and, while we were engaged in contriving how the sac might be opened, or what should be done, he expired on the fourth day.”\*

I have now narrated much of what I have seen or done, in tumours of the head and throat, diseases always dangerous in

\* Where the catheter is to be passed into the œsophagus for the purpose of conveying food into the stomach, it had better be introduced through one of the nostrils, as practised by Deffault. S.



their tendency, by affecting respiration and deglutition, and in which we must often decline operating, from their roots being entangled with the great arteries and nerves. Often when I have seen a patient dying in a miserable and lingering manner, I have wondered that no other means of extirpation has ever been proposed, than that which the knife affords, nor any design invented, by which tumours might be forced to suppurate. To express such a thought implies that a scheme of this nature has presented itself to my imagination, such as, I think, may be successful: it is so, but being yet untried I am bound to submit the following suggestion to you with diffidence, and to mention it without much detail, and with becoming modesty and reserve.

Tumours refuse to suppurate when their substance is peculiarly solid, disease having obliterated the cellular substance of the part: tumours also are difficult to extirpate; and often, in consequence of a hurried, bloody, and imperfect dissection, much of the disease is left behind, because successive inflammations have hardened or filled up the cellular substance which surrounds the gland, and consolidated it as it were into one mass with the surrounding skin and flesh: but could we venture to inject the more solid tumours, so as to restore by moderate violence the cellular interstices, among its integral parts; or could we surround and insulate an apparently immovable tumour from its manifold adhesions, by an injection which would pursue whatever remained of the *tela cellulosa* from cell to cell, we should perhaps attain this desirable end, of forcing the one species of tumour into a state of suppuration, and disengaging the other from the surrounding parts.

What is it peculiar in the texture of a tumour that prevents suppuration? what is the character which implies that it is capable of being resolved? a stony hardness, and extreme specific gravity, indicating that the cellular substance is quite obliterated, that there is no interstitial substance to receive those secretions, which are by time matured into pus: thence it is that in glands indurated to this degree, schirrous as they are named, vascular action being excited by a blow or fall, and accompanied or relieved by no secretion, occasions only pain, ulceration, partial gangrene in each bursting part, and a thin and watery ichor, which is itself an animal poison. The blow-pipe forced into any tumour would, by successive attempts, form those interstices, and injecting the part with oily and camphorated solutions, would force suppuration in the diseases of the salivary, or thyroid, or lymphatic glands, where no operation could be attempted; and, in tumours even of the mamma, it might be advantageous to disengage the part by such injections, as would

throw all the surrounding cellular substance into suppuration, the part itself, incapable of suppuration, would thus be insulated and might be turned out like a kernel from its husk. Such spontaneous suppurations of the surrounding cellular substance, and such happy deliveries from a desperate disease, we have witnessed many times ; and what I have now proposed, though not without many difficulties and objections, is too strong in analogies not to be worthy of some degree of notice. I know not how any tumour could resist this practice : what dangerous consequences could ensue ? none worse than such suppuration. Gangrene, or sloughing, as it is called, when thus local, would be limited to the cellular substance and skin, and the operations of inflating or injecting a tumour for the purpose of suppurating or of unrooting it, could be conducted with such prudence, and, being of the nature of an experiment, would be attempted by such gentle degrees, as would save us from self-reproach, or the misery of doing harm where we intended good.

I have read somewhere of an expression, which often returns upon my ear, "Examples are eloquent ;" I have ever found them the most precious lessons, and been at pains through all my life to record them with care and precision : our reasoning on every professional question, and our proceedings in every new case, must be regulated by precedents, and I have laid before you such examples, and deduced from them such lessons, as you will not despise, for they are the fruits of experience. Of all professional questions, that concerning the nature, tendency, and future consequences of a tumour, seems to me the most solemn : the physician or surgeon may but too easily rid themselves of the importunity of a patient afflicted with a dangerous tumour, for if they will but pronounce any projected operation fatal, the patient will retire from public view, mourn over his helpless and miserable state in solitude, and die a willing martyr to their opinion, and to the too natural abhorrence of pain, and the fear of expiring at once from loss of blood.

## APPENDIX.



### A

THE following explanation of the process employed by nature in arresting the hæmorrhage from divided arteries, appears to me to be much more satisfactory than Mr. Bell's. For the experiments and facts, which prove it, the reader is referred to the work from which it is extracted, "Jones on Hæmorrhage."

"The results of the experiments related in the last section will not allow us to give so concise and simple an account of the process, as has hitherto been done ; but they afford us one more satisfactory, because it accords better with the operations of the animal œconomy, in which we are accustomed to observe the most important changes gradually produced by the co-operation of several means, rather than by the sole influence of any one in particular.

"They accordingly shew, that the blood, the action and even the structure of arteries, their sheath, and the cellular substance connecting them with it—in short, that all the parts concerned in or affected by hæmorrhage, contribute to arrest its fatal progress, by operating, in the case of a divided artery of moderate size, in the following manner.

"An impetuous flow of blood, a sudden and forcible retraction of the artery within its sheath, and a slight contraction of its extremity, are the immediate and almost simultaneous effects of its division. The natural impulse, however, with which the blood is driven on, in some measure counteracts the retraction, and resists the contraction of the artery. The blood is effused into the cellular substance between the artery and its sheath, and passing through that canal of the sheath which had been formed by the retraction of the artery, flows freely externally, or is extravasated into the surrounding cellular membrane, in proportion to the open or confined state of the external wound. The retracting artery leaves the internal surface of the sheath uneven by lacerating or stretching the cellular fibres that connected them. These fibres entangle the blood as it flows, and



thus the foundation is laid for the formation of a coagulum at the mouth of the artery, and which appears to be completed by the blood, as it passes through this canal of the sheath, gradually adhering and coagulating around its internal surface, till it completely fills it up from the circumference to the centre.

“ A certain degree of obstruction to the hæmorrhage, which results from the effusion of blood into the surrounding cellular membrane, and between the artery and its sheath, but particularly the diminished force and velocity of the circulation, occasioned by the hæmorrhage, and the speedy coagulation of the blood, which is a well known consequence of such diminished action of the vascular system, most essentially contribute to the accomplishment of this important and desirable effect.

“ A coagulum then, formed at the mouth of the artery, and within its sheath, and which I have distinguished in the experiments by the name of the external coagulum, presents the first complete barrier to the effusion of blood. This coagulum, viewed externally, appears like a continuation of the artery, but on cutting open the artery, its termination can be distinctly seen with the coagulum completely shutting up its mouth, and inclosed in its sheath.

“ The mouth of the artery being no longer pervious, nor a collateral branch very near it, the blood just within it is at rest, coagulates, and forms, in general, a slender conical coagulum, which neither fills up the canal of the artery, nor adheres to its sides, except by a small portion of the circumference of its base, which lies near the extremity of the vessel. This coagulum is distinct from the former, and I have called it the internal coagulum.

“ In the mean time the cut extremity of the artery inflames, and the vasa vasorum pour out lymph, which is prevented from escaping by the external coagulum. This lymph fills up the extremity of the artery, is situated between the internal and external coagula of blood, is somewhat intermingled with them, or adheres to them, and is firmly united all round to the internal coat of the artery.

“ The permanent suppression of the hæmorrhage chiefly depends on this coagulum of lymph ; but while it is forming within, the extremity of the artery is farther secured by a gradual contraction which it undergoes, and by an effusion of lymph between its tunics, and into the cellular membrane surrounding it ; in consequence of which these parts become thickened, and so completely incorporated with each other, that it is impossible to distinguish one from the other : thus, not only is the canal of the artery obliterated, but its extremity also is completely effaced, and blended with the surrounding parts.

“ From this view of the subject we can no longer consider the suppression of hæmorrhage as a simple or mere mechanical effect, but as a process performed by the concurrent and successive operation of many causes : these may briefly be stated to consist in the retraction and contraction of the artery ; the formation of a coagulum

at its mouth ; the inflammation and consolidation of its extremity by an effusion of coagulating lymph within its canal, between its tunics and in the cellular substance surrounding it."

## B

To Dr. Jones, likewise, we are indebted for a more complete explanation of the effect of ligatures upon arteries, than that given by Mr. Bell. The following account is extracted from p. 153—4 of his work.

" 1. To cut through the internal and middle coats of the artery ; and to bring the wounded surfaces into perfect opposition.

" 2. To occasion a determination of blood on the collateral branches.

" 3. To allow of the formation of a coagulum of blood just within the artery, provided a collateral branch is not very near the ligature.

" 4. To excite inflammation on the internal and middle coats of the artery by having cut them through, and consequently, to give rise to an effusion of lymph, by which the wounded surfaces are united, and the canal is rendered impervious : to produce a simultaneous inflammation on the corresponding external surface of the artery, by which it becomes very much thickened with effused lymph ; and at the same time from the exposure and inevitable wounding of the surrounding parts, to occasion inflammation in them, and an effusion of lymph, which covers the artery, and forms the surface of the wound.

" 5. To produce ulceration in the part of the artery round which the ligature is immediately applied, viz. its external coat.

" 6. To produce indirectly a complete obliteration, not only of the canal of the artery, but even of the artery itself to the collateral branches on both sides of the part which has been tied.

" 7. To give rise to an enlargement of the collateral branches.

" In the account which I have now given of the effects of the ligature on the artery, I have had in view only those instances, in which the ligature has been applied on the extremity of a divided artery, or those in which two ligatures have been applied on an artery, at a small distance from each other, and the intermediate portion divided. But, from observation on the human subject, it appears, that the effects are different, or at least their accomplishment is much more likely to be interrupted, when one or two ligatures are applied on an artery without any subsequent division of it."

## C

Dr. Jones has fully proved that there is not so much danger to be apprehended from drawing the ligature upon the artery with considerable firmness ; if, however, the surgeon should be afraid of the

ligature's being thrown off by the force of the circulation, he may absolutely prevent it by passing the needle through the coats of the artery, between its mouth and the former ligature and tying another knot. After doing this, the ligature cannot be pulled away without great force is used.

In addition to what Mr. Bell has said upon the subject of secondary hæmorrhage, the following observations are extracted from Dr. Jones's work p. 181, and seq.

"There is yet another cause of secondary hæmorrhage, which, although I have hinted at it once or twice in the preceding parts of this treatise, I have not yet represented it in the important point of view which it ought to be. I allude to the sudden separation or laceration of the recently united parts of an artery by premature and extraordinary exertions of the patient.

"That newly cicatrized wounds may easily be torn asunder, for a certain time after their union, a sufficient number of proofs might be adduced, if any were required, from the operation for the hare lip; but in these, and other instances of disunited wounds in fleshy parts, the united surfaces had been more or less broad, and, of course, their adhesion proportionably strong; whereas in the case of a recently united artery, the cicatrized part is a mere line, and, consequently, weak, and easily torn through: it is, therefore, of the utmost importance to keep the limb, a large artery of which has been tied, in a state of the most perfect rest, and to prohibit and guard, as much as possible, against the patient's making any sudden or great exertion. In the case of amputation which gave rise to Petit's invention for compressing divided arteries, secondary hæmorrhage was brought on, on the twenty-first day after the operation, by the patient's raising himself suddenly and sitting up in bed. On this subject Petit makes the following observation: "But in every case it is absolutely necessary that the patient and the wounded part should remain in a complete state of rest:"\* in which, however, he seems rather to have had in view the perfect formation of the clot, for he afterwards adds: "because the formation of the clot is disturbed by a change of position."† But the remark is not the less valuable and worthy of attention: nor does this allusion to the clot prove that he was ignorant of the state of the extremity of the artery; for in a former memoir, after describing how he conceived the particular figure of the clot, formed in an artery that had been tied, would prevent hæmorrhage, even though the extremity of the artery should ulcerate; he adds: "It is not the same thing when some convulsion or some other violent motion on the part of the patient causes a separation of the ligature; because this separation happens before the vessel is perfectly closed, and moreover, the coagulum, notwithstanding its figure, is pushed with such violence that it not only escapes, but in its passage destroys whatever re-union may have

\* Petit, *Memoires de l'Acad. &c. de l'année 1732.*

† *Ibid. ibid.*



taken place, and the mouth of the vessel as large as ever, discharges the blood as in the first day of its division."†

Scarpa, in his treatise on aneurism, lays great stress on keeping the patient in a state of rest, and recommends moderating the force of the circulation, by bleeding in the first instance, if it should be necessary, and afterwards keeping the patient on very low diet for some time. He mentions several cases in which secondary hæmorrhage took place several weeks after tying a large artery, apparently and in all probability, from some exertion on the part of the patient.

## D

In describing the manner in which aneurisms are found, Mr. Bell states what was universally admitted to be correct at the time he wrote. Since that the celebrated Scarpa has published a work upon aneurisms, in which he has proved, that, in a vast majority of instances at least, aneurism is the effect of a rupture in the coats of the artery, the consequence of violence or disease. Scarpa, indeed, contends for the universality of this breach in the coats of the vessel, but in this he is perhaps not altogether correct. I have certainly seen an incipient aneurism which *appeared* to be the effect of dilatation, though I confess I did not examine it so minutely as I might have done, as at that time no doubts were entertained on this subject. The truth now appears to me to be this, that sometimes in the incipient stage of aneurism, the internal coat of the artery, at least, is dilated, but when the tumour becomes increased in size, this too gives way.

The following extract from Scarpa,‡ contains his opinions upon this subject, from which a correct idea of the truth or fallacy of his doctrine may be formed.

"The internal coat of an artery being ulcerated or lacerated from a slow internal cause in some point of its circumference, (which he supposed always happens in spontaneous aneurism,) the blood impelled by the heart begins immediately to ooze through the connections of the fibres of the muscular coat, and gradually to be effused into the interstices of the cellular covering, which supplies the place of a sheath to the injured artery, and forms for a certain space, a kind of *ecchymosis*, or *extravasation of blood*, slightly elevated upon the artery. Afterwards, the points of contact between the fibres of the muscular coat being insensibly separated, the arterial blood penetrating between them, fills and elevates, in a remarkable manner, the cellular covering of the artery, and raises it after the manner of an incipient tumour. Thus, the fibres and layers of the muscular coat being wasted or lacerated, or simply separated from each other, the arterial blood is carried with greater force, and in greater quantity than before, into the cellular sheath of the artery, which it forces more out-

† Petit, Mem. de l'Acad. &c. de l'année 1731.

‡ See Wishart, p. 73 & seq.

wards : and, finally, the divisions between the interstices of the cellular coat being ruptured, converts it into a sac, which is filled with polypous concretions, and with fluid blood, and at last forms, properly speaking, the aneurismal sac ; the internal texture of which, although apparently composed of membranes placed one over the other, is, in fact, very different from that of the proper coats of the artery, notwithstanding the injured artery, both in the thorax and in the abdomen, as well as the aneurismal sac, is covered externally, and enclosed within a common smooth membrane.

“ In the very considerable number of aneurisms of the arch, and of the thoracic and ventral trunk of the aorta, commonly regarded by medical men as *true* or *incysted*, or as formed by a dilatation of the proper coats of the great artery, which I have had an opportunity of examining, I have not found a single one, in which the rupture of the proper coats of the artery was not evident, and in which, consequently, the aneurismal sac was produced by a substance completely different from the internal or muscular coat of the injured artery. To ascertain the truth, and confirm the constancy of this fact, it is not necessary that one should be possessed of uncommon knowledge in the art of dissection, but only that he be disposed to see things as they really exist, and that he undertake to examine the aneurism in the situation in which it is found, and without removing the parts which surround it, or at least that he do this with due circumspection. For, as I have asserted above, very often the examination which is made by medical men, of internal aneurisms in the dead subject, consists of little more than a simple division of the fundus of the tumour, without paying attention to the cellular sheath which surrounds the artery, above and below the place of the aneurism, and without examining the disposition and particular characters of the proper coats of the aneurismatic artery, and comparing it with the substance which forms the parietes of the aneurismal sac ; and what is still worse, the aneurism is examined by some, after being removed from the body, and filled with some substance, or dried ; in which preparations, there is nothing to be seen but confusion and obscurity, in every thing which relates to the true nature and structure of the parts by which the tumour is formed.

“ A circumstance very important to be known relative to this subject, has been hinted at above ; viz. that the aneurismal sac never comprehends the whole circumference of the injured artery, but only a portion of the arterial tube, to which the tumour is united on the one or the other side. At this place, the aneurismal sac presents, as it were, a species of constriction, or neck, beyond which the sac of the aneurism is more or less enlarged, or expanded, and sometimes to an enormous degree. This circumstance would never accompany aneurism, or rather, quite the contrary would be found, if the aneurismal sac were produced by an equable distention of the tube and of the proper membranes of the aneurismatic artery. For, in incipient aneurisms, at least, the greatest effect of the distention acting upon the tube of the artery, the greatest size of the tumour ought to be in the artery itself, or in the beginning or root of the tu-

mour, and the least at its fundus. But observation demonstrates, that, whether the aneurism be recent and small, or of long standing and large, the passage from the artery is always narrow, and the fundus of the aneurism, the farther it is removed from the artery, the more it is enlarged. Another circumstance worthy of attention on this head, which I have likewise pointed out above, is, that the aneurismal sac is always covered by the same soft distensible cellular substance, which in the sound state surrounded the artery, and united it to the adjacent parts; which soft cellular substance, supposing it to be an aneurism of the arch, or of the thoracic trunk of the aorta, is covered by the pleura, and if the aneurism is in the abdomen, by the peritoneum; which membranes include the aneurismal sac, together with the ruptured artery, and present externally, a continued, smooth, shining surface, as if the artery alone was in that way dilated.

“ But if, instead of dividing, as is commonly done, the fundus of the aneurismal sac, the aorta be divided lengthwise on the other side, and opposite to the constriction or neck of the tumour, the place of the ulceration, or of the rupture of the proper coats of the artery, immediately appears within the artery, on the side opposite to that where the incision was made, and the fissure which has taken place is immediately discovered, the edge of which is sometimes fringed, often callous and hard, like that of a fistula; through which fissure the arterial blood had formed itself a passage into the cellular sheath of the artery, afterwards converted into an aneurismal sac. If, as sometimes happens in the arch of the aorta in the vicinity of the heart, the artery, before being ruptured, has suffered some degree of enlargement beyond its usual diameter, it appears at first sight that there are two aneurisms; but the constriction or neck which the aneurismal sac next to the artery presents externally, points out exactly the limits, beyond which the internal and muscular coat of the aorta had not been able to resist the distention, and have therefore been torn by it, and shows clearly the difference existing between an aneurism and a simple enlargement in diameter of the tube of the aorta in the vicinity of the heart.

“ The rupture in the artery is always small in proportion to the large size of the aneurismal tumour; so that when the arch of the aorta has suffered some degree of dilatation before bursting, as sometimes happens near its passage out of the heart, on making an incision on one side into the aneurismal sac, and on the other into the tube of the artery lengthwise, two sacs present themselves, separated from each other by means of a partition or diaphragm lacerated in its middle; which partition is formed of nothing else than the remains of the internal and muscular coats of the ruptured artery. And as the limits of the proper coats of the aorta, and the beginning of the cellular aneurismal sac, are marked externally by that kind of constriction or neck which the tumour presents in the vicinity of the artery; in the same manner, internally, this partition,



torn in its middle, determines the precise point of the rupture of the proper coats of the artery occupied by aneurism.

“All this acquires a degree of demonstration and certainty, to which nothing can be opposed, by carefully dissecting the proper coats of the ruptured aorta in its situation, and comparing them at the same time with the cellular substance forming the aneurismal sac; for, in the incision made in the direction of the axis of the aorta, and in its side opposite to that where the rupture has taken place, its proper coats are found either perfectly sound, or a little weakened and intermixed with earthy points, but still capable of being separated distinctly into layers from one another; when, on the contrary, in the opposite side of the aorta, where the ulceration or laceration exists, its proper coats are met with unusually thin, blended together, and with difficulty, or in no way capable of being separated from each other, intermixed very often with heterogeneous substances, which render them brittle like the shell of an egg; and, lastly, disorganized and torn at the place where they form that species of partition, which marks the limits between the ruptured artery and the entrance of the aneurismal sac. Continuing to separate these coats from within outwards, we come to the cellular sheath which surrounds the aorta externally. Then, on removing the cellular pulpy sheath of the aorta, it is found smooth externally, like the artery, villous, cellular, and irregular internally, extending from the circumference of the tube of the artery over the neck and fundus of the aneurismal sac. This external covering or sheath of the artery actually appears, to those who are not sufficiently skilled in such dissections, as if the artery were dilated under it to such a degree as to form the aneurism; and it has still more that appearance if the aneurism is very large and of long standing, since in this case the cellular sheath of the artery becomes unusually thick and pulpy, and because it adheres very firmly to the subjacent muscular coat of the artery at the stricture or neck of the aneurismal sac.—But even in these cases, as well as in those of recent and small aneurisms of the aorta, by employing care, we may at least succeed in separating, without laceration, this cellular sheath from the tube of the artery, above and below the injury, and successively from the subjacent muscular coat, as far as the neck or root of the aneurism. It is then clearly perceived that the muscular coat of the aorta does not pass beyond the partition which divides its tube from the entrance of the aneurismal sac; and it is distinctly observed, that the fibres and layers of the muscular coat are not prolonged over the aneurismal sac, but terminate like a fringe, or in obtuse points, at the edge of the rupture of the artery. On which account, nothing can be more evident than that the aneurismal sac does not belong at all to the artery, and that, properly speaking, it is only the cellular sheath, which in the sound state covered and connected the artery to the neighbouring parts, which, being elevated by the effused blood, at first in the manner of an *ecchymosis*, then distended and compressed, has acquired that degree of density, and of additional hardness

and thickness, as if it had been formed by the proper coats of the artery, prodigiously relaxed, distended, and thickened. These appearances the more readily lead to error, as both the injured artery and the aneurismal sac, as has been frequently mentioned, are covered by a common smooth membrane externally, such as the pleura in the thorax, and the peritoneum in the abdomen.

“ From all that has been hitherto said with regard to aneurism in general, and more particularly of that of the aorta, it appears to me, that we may with certainty conclude, 1st, That this disease is invariably formed by the rupture of the proper coats of the artery. 2dly, That the aneurismal sac is never formed by a dilatation of the proper coats of the artery, but undoubtedly by the cellular sheath which the artery receives in common with the parts contiguous to it; over which cellular sheath the pleura is placed in the thorax, and the peritoneum in the abdomen. 3dly, That if the aorta immediately above the heart appears sometimes increased beyond its natural diameter, this is not common to all the rest of the artery; and when the aorta in the vicinity of the heart yields to a dilatation greater than natural, this dilatation does not constitute, properly speaking, the essence of aneurism. 4thly, That there are none of those marks regarded by medical men as characteristic of aneurism from *dilatation*, which may not be met with in aneurism from *rupture*, including even the circumscribed figure of the tumour. 5thly, That the distinction of aneurism into *true* and *spurious*, adopted in the schools, is only the production of a false theory; since observation shows, that there is only one form of this disease, or that caused by a *rupture* of the proper coats of the artery. and an effusion of arterial blood into the cellular sheath which surrounds the ruptured artery.”

## E

This figure, I am satisfied from the description, although the author is not cited, refers to a supposed case of dilatation of the coats of an artery by Dr. Donald Monro. The following is an account of a dissection of that case by Monro the father. The account is given in a letter to the son who had sent the parts to Edinburgh to be dissected.

“ The aneurismal sacs you sent to Edinburgh were dissected by your brother, in my presence; the appearances were the following. The external loose cellular, and the cellulo-membranous coats being dissected away carefully, the circular fibrous, commonly called the muscular coat, was evidently continued on all the three small sacs, in every part of them. but was thicker there than in the sound part of the artery,” and *what is worthy of the greatest attention*, “ in the most enlarged part of the sacs, an extraneous substance, resembling a soft steatomatous matter was intermixed with the muscular fibres. The cellular substance being the inside of the muscular coat, was considerably thicker than natural, and had much the appearance of

an extraneous substance filling its cells. The internal membrane of the artery adhered so firmly to these cells, that it could not be separated, but seemed thicker than in a sound state."

From the foregoing account we are at a loss to determine whether the artery was dilated at these enlargements. Scarpa says it *certainly* was not.

## F

### DIRECTIONS FOR PERFORMING THE OPERATION FOR POP- LITEAL ANEURISM.

Having prepared the patient, if he be at all plethoric, by low diet and the administration of purgative medicines. you provide yourself with the following apparatus ; a common convex edged bistoury, an eyed probe, two of the smallest sized needles, each armed with a waxed ligature of moderate thickness, a tenaculum with a few ordinary ligatures, some straps of sticking plaster, a little lint and a six-tailed bandage. Tye the two ligatures together which are provided with needles, then pass the knot through the eye of the probe and secure it there in such a manner that the ligatures will be of equal length, and cannot slip.

The patient is to be placed upon a table near its edge, with his head somewhat elevated, and the leg and thigh of the affected side in a state of semiflexion and supported on a pillow. The surgeon should ascertain the course of the artery by feeling its pulsation as it passes from under the crural arch down on the inner side of the thigh. The incision which is to be about three inches in length, is to be made along the inner edge of the sartorius muscle in such a manner that the inferior angle of the wound will just reach the apex of the triangle formed by the convergence of the adductor brevis and vastus internus of the thigh. The first incision should be of sufficient depth to expose the fascia lata of the thigh, the next stroke of the knife will lay open this and expose the fibres of the sartorius muscle which covers the artery in some degree, which is therefore to be drawn outward ; this immediately exposes the tendinous sheath which incloses the artery, vein, and anterior crural nerve. This sheath is to be very cautiously opened for about an inch, and then the artery is to be completely separated from the vein and nerve with the nail, or handle of the scapel so as to avoid wounding the coats of the vessel. The probe being gently curved is now passed under the artery, and the two ligatures are thus carried under the vessel which must now be separated from the probe and from each other. One ligature is to be carried as high as possible on the artery, and the other as low down, and then the surgeon having satisfied himself that the ligatures include nothing but the naked vessel, he proceeds to tye the upper one with considerable firmness and an ordinary knot. Should he apprehend the ligature's



being thrown off, let him pass the needle through the coats of the artery and tie another knot which will effectually prevent it. The lower ligature is now to be tied in the same manner, and then the vessel is to be divided and suffered to retract. The ligatures are to be left of a moderate length hanging out from each angle of the wound which is to be drawn together with straps of sticking-plaster, and the whole secured by the six-tailed bandage. A small dose of opium may be administered after the patient is carried to bed, where he is to be kept in a state of rest, and upon low diet for some time. The limb is to be kept in the easiest position with a tourniquet around it, in case of accident, and covered with flannel. Should it become very cold, bladders filled with warm water are to be applied.

Immediately after the first ligature is tied, all pulsation ceases in the aneurism, which after some days, begins to diminish and is ultimately absorbed.

This is the method of securing every artery where it is tied at a distance from the aneurism; when it is necessary to open the aneurismal sac, a different plan is to be pursued.

## G

When the thigh-bone is luxated, and the head of it is lodged either upon the os pubis, or in the foramen thyroideum, it may be reduced in the following manner.

The patient is to be extended, upon his back, upon a firm table, a broad bandage is then to be passed around the pelvis, the two ends of which are to be made fast to a pillar, or some other firm object on the side of the patient, opposite to the luxated extremity. Another bandage is to be passed around the dislocated thigh as high as possible, that is in contact with the perinæum which is to be secured in the same manner as the other, but on the opposite side. The bandages should be made of such materials and drawn so tightly as not to yield, when the attempt to reduce the luxation is made. This is to be done by extending the leg upon the thigh and then using the whole limb as a lever, in which the resistance is at one end, the power at the other, and the fulcrum, which is the bandage around the luxated limb, in the middle, which is done by forcing the luxated limb suddenly and smartly across the other. In this way, if the bandages are properly fixed and of sufficient strength, any requisite degree of force may be applied. This method of reduction I have seen practised by Mr. Astley Cooper with success.

But when the head of the thigh-bone is lodged in the ischiatic notch or upon the dorsum of the ileum, then recourse must be had to other and more effectual means. The first thing to be attended to is the fixing of the pelvis. If this is attempted with bandages only, the table on which the patient is placed must be very heavy and strong, and the bandages must be sufficiently long to fasten him securely to it.

A better plan has, I think, been recommended, of making the patient sit astride a beam wrapped round with cloths sufficient to prevent injury to the perinæum. The extension, which must be very powerful and long continued, and more depends upon the length of time than the degree of force, is to be made downwards and outwards, in the latter direction first, to detach the bone from its unnatural position, and enable it when the force acting downwards is applied, to slip over the edge of the acetabulum into the socket. In order to diminish the resistance from the muscles, various remedies have been used, of these, bleeding, to as great an extent as the patient can conveniently bear, is by far the best. Fainting should be brought on, if practicable, without too great a loss of blood. Tobacco injections have proved fatal and ought therefore, I think, never to be used.

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